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Seasonal Status, Relative Abundance, and Behavior of the Birds of Concepción, Departamento Santa Cruz, Bolivia

Susan E. Davis

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Seasonal Status, Relative Abundance, and Behavior of the Birds of Concepción, Departamento Santa Cruz, Bolivia

Susan E. Davis

Abstract

Concepción is located in the eastern lowlands of Bolivia on the western edge of the Brazilian Shield. The vegetation of the region is a mosaic of semideciduous forest, wooded savanna (*cerrado*), and savanna wetland. The area has a "savanna climate" with a pronounced dry season during the austral winter (April/May–August/September).

A survey of the avifauna of the region was made during a 2½-year residence in Concepción. A preliminary list of 257 species includes data on seasonality, breeding, relative abundance, habitat use, foraging position, and sociality. Noteworthy observations are detailed in 47 species accounts. At least 30% of the species recorded are not permanent residents: 11 species are North American migrants, 23 are austral migrants, 17 are local migrants, and 27 are occasional visitors. Of the 48 migrant species, 18 are dry-season residents, 11 are wet-season residents, 16 are transient, and 3 are partial migrants.

The composition of the bird fauna of Concepción illustrates the unique nature of the region as a zone of transition between major biogeographical regions: evergreen Amazonian forest, subtropical Chacoan thorn-scrub, and the *cerrado* vegetation of the central Brazilian Plateau. The birds of both forest and savanna habitats in the vicinity of Concepción are threatened as land is cleared for cattle ranching, timber harvesting, colonization, and urbanization. Many savanna species seem able to adapt to alteration of their natural habitats, but the forest species do not display such flexibility. Most species recorded in savanna also use man-altered habitats, whereas more than half of the forest species were never recorded in nonforested or man-altered habitats. Before crucial habitats are destroyed, further work is needed to complete the species list for the region and to describe completely the seasonality of the avian communities.

Introduction

Bolivia has one of the most diverse avifaunas in the world with 1,288 species recorded (Remsen & Traylor, 1989; Parker et al., 1991), and yet it is one of the least-studied countries in South America. Situated in the center of the continent, Bolivia has a wide variety of habitats ranging from Amazonian rain forest to Chacoan thorn-scrub, from Andean puna to lowland savanna. The Brazilian (Precambrian) Shield region in the eastern Departamento Santa Cruz (provincias Ñuflo de Chavez, Velasco, and Chiquititos) is one of the more poorly studied areas in the country. Known locally as Chiquitanía, the area is recognized as a distinct cultural and geographic region, and it has a unique natural history when compared to the rest of the eastern lowlands.

Colonized over 250 years ago by Jesuit missionaries, the landscape of Chiquitanía remains largely unaltered. The local inhabitants have used the savanna for cattle production while exploiting the forest for its timber and wildlife. Slash-and-burn agriculture causes some forest destruction, but because the area is sparsely populated, the amount of forest lost in this manner is small. However, in recent years the rate of forest destruction has increased due to the use of heavy equipment

that allows ranchers to turn forested areas into "improved" pastures.

The avifauna of Chiquitanía has not been well studied. Birds have been collected sporadically in the area (Paynter et al., 1975; Remsen et al., 1985, 1986, 1987; Schmitt et al., 1986), but little has been published on their natural history. Here I present data collected during a 2½-year residence in Concepción, a town of approximately 2,000 inhabitants on the western edge of the Brazilian Shield (fig. 1). Such an extended field study allowed me to become familiar with the birds of a small area and to collect data throughout the yearly cycle, thereby compiling information on seasonal fluctuations in the composition of the bird communities. To my knowledge, there are no data published on seasonality in bird distribution in Bolivia based on year-round surveys of a single locality.

Study Area

Data were collected in an area extending up to 75 km from Concepción (provincia Ñuflo de Chavez; 16°08′S, 62°02′W; elev. ca. 500 m) (fig. 1). The relatively flat topography of the area is broken periodically in the south by low hills and granitic domes (*lajas*) rising to 700 m, and in the west by the Serranía de San Lorenzo, a chain of low mountains rising to 900 m. Figure 2 summarizes 31 years (1955–1986) of meteorological data recorded at the Concepción airport. The region experiences a typical "savanna climate" with a marked dry season during the austral winter. Mean daily temperature varies only slightly throughout the year. The lowest temperatures occur during the austral winter, when cold fronts sweep up from the south; these *surazos* are accompanied by strong winds and sometimes rain. Temperatures recorded during this study ranged from 35°C in November 1985 to 5°C in June 1986. Four seasons are recognized, and hereafter the use of the terms "spring," "summer," "fall," and "winter" refers to these seasons as they occur in the Southern Hemisphere.

Vegetation of Chiquitanía

Floristically, the vegetation of the area, like much of the Brazilian Shield region in eastern Santa Cruz, contains elements of the evergreen tropical rain forest of the Amazon Basin and the subtropical thorn-scrub of the Gran Chaco. However, it most closely resembles the semideciduous forests and *cerrado* vegetation of the central Brazilian Plateau (fig. 3). Killeen et al. (1990) presented a preliminary description of the vegetation of the Brazilian Shield region, and the following description of the study area is based on that report.

The term *cerrado* refers to a complex of intergrading plant communities that occur on well-drained soils and range from low forest to open grassland (Eiten, 1978). This vegetation type is characterized by low (6–8 m) trees displaying a twisted aspect, coriaceous foliage, and corky bark. Most species are deciduous, and although species vary in timing of leaf drop and replacement, most lose their leaves during the dry season. Common woody species in this Bolivian *cerrado* include *Curatella americana* (Dilleneaceae), *Qualea grandiflora* (Vochysiaceae), *Dimorphandra gardneriana* (Leguminosae), *Tabebuia aurea* (Bignoniaceae), *Acrocomia totai* (Palmae), and *Terminalia argentea* (Combretaceae). The herbaceous component of *cerrado* comprises principally grasses, the dominant species including *Elionurus adustus, Schizachyrium sanguinium, Thrasya petrosa,* and *Paspalum erianthum.* The *cerrado* usually is burned at the end of the dry season (August/September). Fire stimulates the regrowth of the grass sward and initiates the reproductive cycle for many herbaceous species (Killeen et al., 1990).

Closely associated with *cerrado* communities is a treeless wetland that forms a clinal sequence along a gradient of increasing water surplus. These "valley-side *campos*" (Eiten, 1978) occur along erosional surfaces wherever there is a fluctuating, perched water table that seeps out on gently sloping valley sides. At the bottom of the slope, the herbaceous vegetation becomes robust, attaining a height of more than 2 m. This savanna marsh intergrades with gallery forest dominated by the palm *Scheelea princeps,* or with swamp forest characterized by the palm *Mauritia flexuosa.*

In moderately sized valleys with flat bottoms, another distinct complex of savanna wetland is found. Impeded drainage or the overflow of streams leads to the formation of a mosaic of seasonally humid and inundated grassland that is similar to the *pantanal* or *murundus* savanna of Brazil. Scattered across these open grasslands are raised-earth platforms, built up by the action of termites, that support woody *cerrado* species or low forest-scrub.

In addition to the savanna associations, there

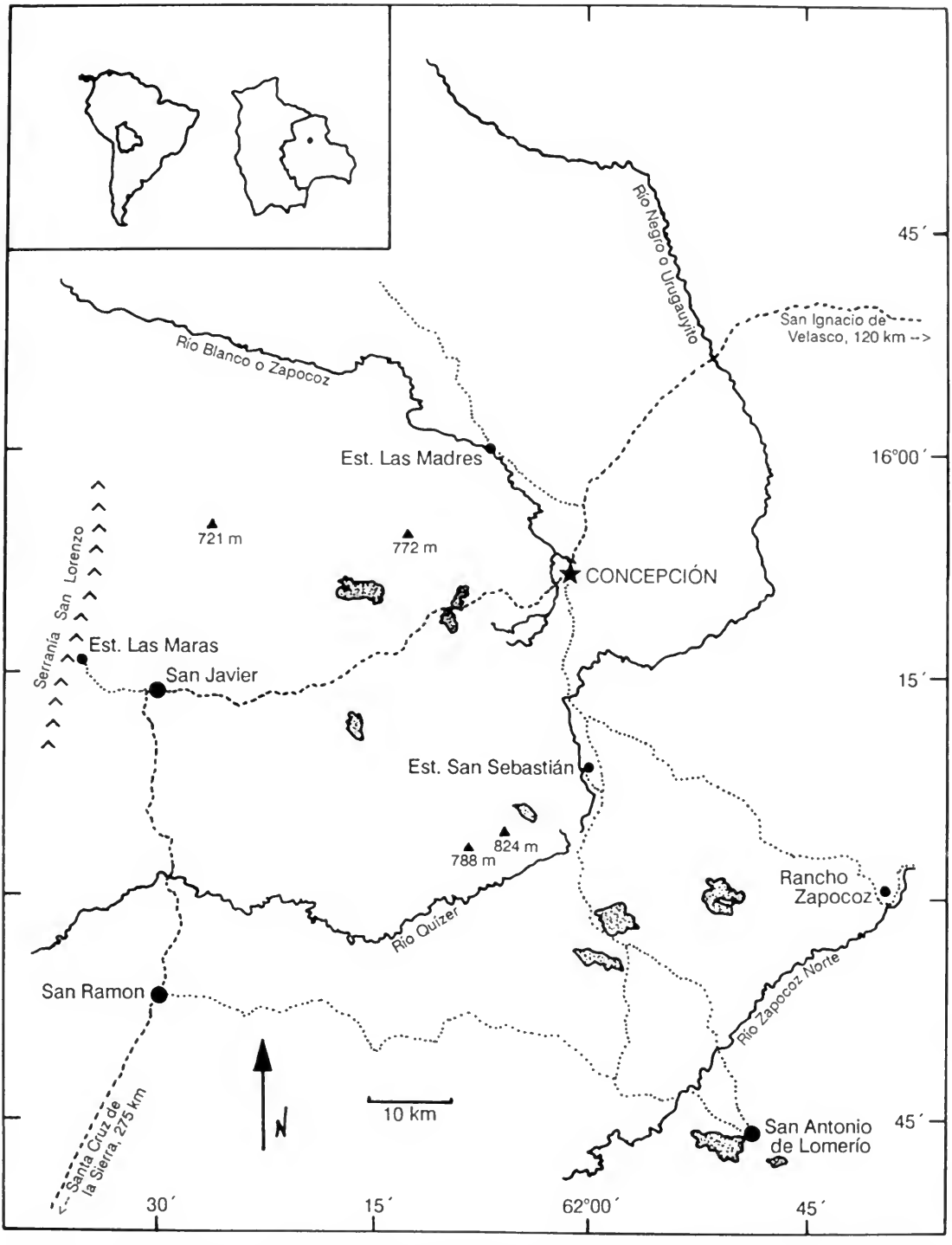

FIG. 1. Map of the region of Concepción and Lomerío, Dpto. Santa Cruz, Bolivia. Stippled areas indicate granitic outcrops. Inset at upper left shows location of Bolivia within South America (left) and location of Concepción (dot) in Dpto. Santa Cruz within Bolivia (right). Collection sites included Concepción, Est. Las Madres, Est. San Sebastián, Est. Las Maras, and Rancho Zapocoz.

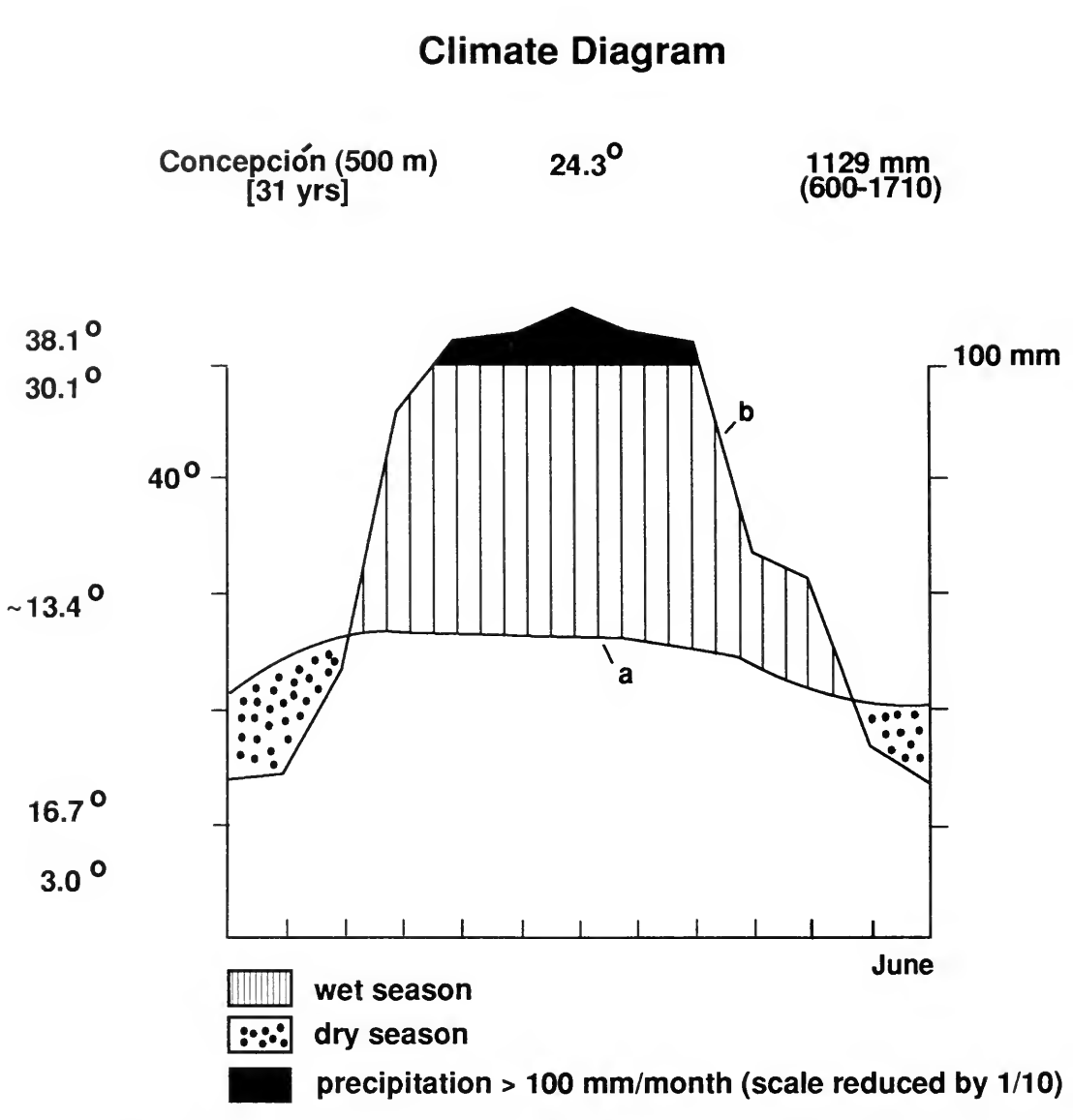

FIG. 2. Climate diagram of Concepción, Dpto. Santa Cruz, Bolivia. a = curve of monthly averages of temperature, b = curve of monthly averages of precipitation. Listed across the top from left to right are locality (altitude) [number of years of data], mean annual temperature, and mean annual precipitation (minimum–maximum). Noted along the left margin from top to bottom are maximum registered temperature, daily average of maximum temperature during the warmest month of the year (November), daily average of temperature fluctuation, daily average of minimum temperature during the coolest month of the year (June), and minimum registered temperature. [Adapted from Killeen et al., 1990.]

are a variety of forest communities. A typical forest in well-drained soils is semideciduous and of medium stature, with a canopy ranging from 12 to 18 m and emergents rarely exceeding 25 m in height. Common arboreal species include *Anadenanthera macrocarpa* (Leguminosae), *Astronium urundueva* (Anacardiaceae), *Poeppigia procera* (Leguminosae), and *Cedrela fissilus* (Meliaceae). Less common but characteristic of this forest is the "bottle tree" *Chorisia speciosa* (Bombacaceae). Low forest-scrub, frequently dominated by the arboreal bamboo *Guadua paniculata,* is common in the transition between forest and savanna, and semideciduous forest islands of 1–100 ha are scattered throughout *cerrado.* Finally, a more humid semideciduous forest occurs at the base and on the

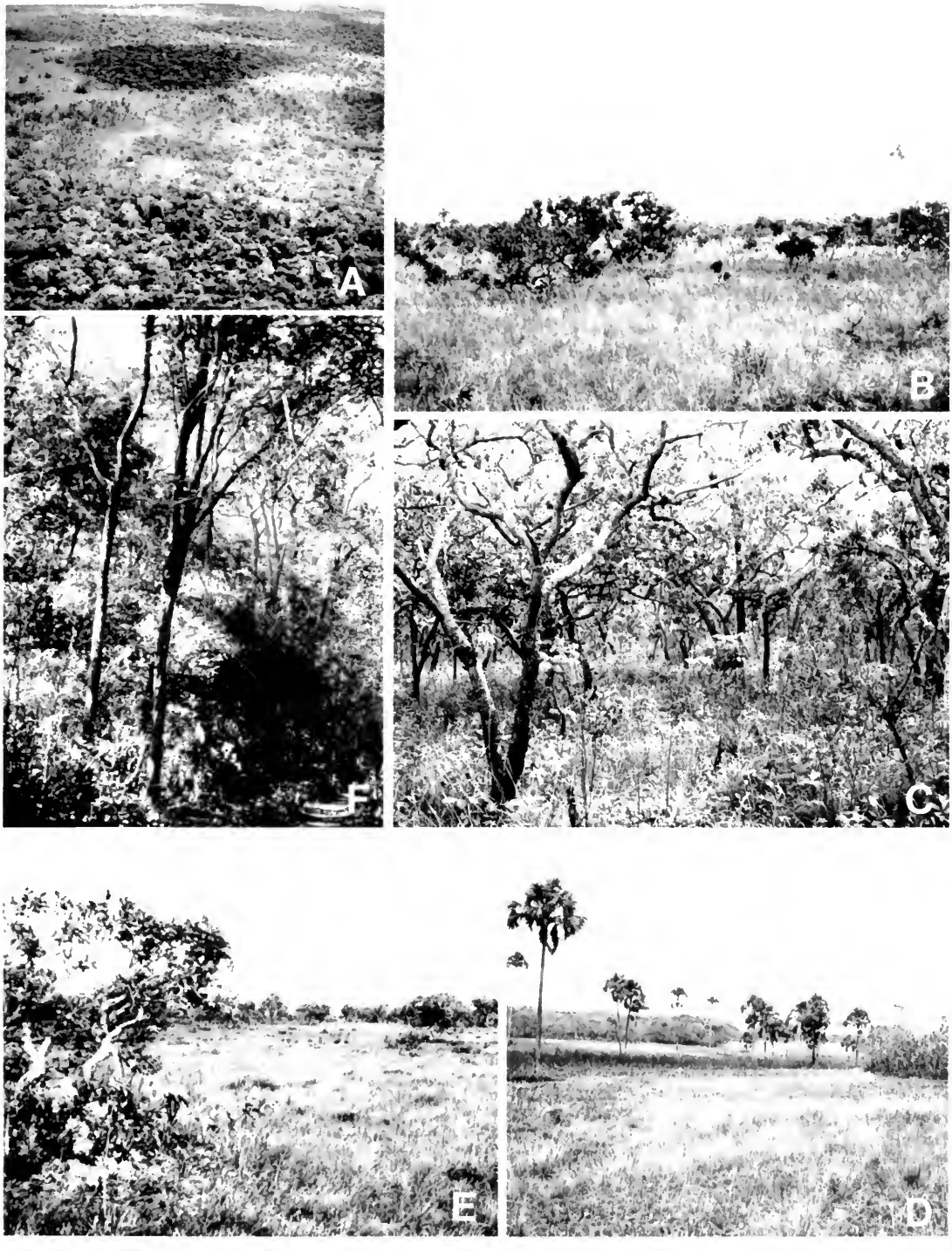

FIG. 3. Vegetation types in the region of Concepción, Bolivia. **A**, Aerial photograph showing vegetation mosaic of *cerrado*, valley-side *campo*, and semideciduous forest. **B**, *campo cerrado*. **C**, *cerrado*. **D**, valley-side *campo*. **E**, seasonally inundated savanna complex with termite mounds. **F**, semideciduous forest. [From Killeen, 1991.]

slopes of the Serranía de San Lorenzo. The stature of this semihumid forest is similar to that of dry forest. Its composition has not been described, but, historically, it contained mahogany (*Swietenia macrophyla,* Meliaceae), a rare species in the study area that recently has been extirpated.

The savanna and forest communities described above have been divided further into distinct habitat types that the birds appear to recognize (see the key following Table 1).

Methods

The species list presented here is based on data collected from May 1985 to November 1987. In addition to visual surveys, the bird fauna was sampled with mist-nets at various locations (fig. 1). Birds were collected in *cerrado* and forest islands on Estancia Las Madres in November 1985 (16 nets, 110 net hr) and February 1986 (13 nets, 56 net hr), in dry semideciduous forest near Rancho Zapocoz in July 1985 (9 nets, 70 net hr) and November 1986 (10 nets, 44 net hr), and in similar forest on Estancia San Sebastián in February 1987 (10 nets, 30 net hr). Near Concepción, birds were collected in disturbed *cerrado* in July 1985 (9 nets, 43 net hr), September 1985 (6 nets, 22 net hr), March 1986 (6 nets, 12 net hr), and May 1986 (6 nets, 13 net hr), and in second-growth scrub and woodland in March–April 1986 (6 nets, 22 net hr). The bird fauna of the semihumid semideciduous forest at the base of Serranía San Lorenzo, on Estancia Las Maras, was sampled in February 1987 (7 nets, 28 net hr).

At each site, standard mist-nets (12 × 2.6 m, mesh 35 mm) were set end-to-end. To sample different strata of the vegetation, the height at which nets were placed was varied during a collecting period. Generally, nets were placed at ground level for half the period and then set 2–6 m aboveground, or half the nets used were set at ground level while the remainder were set aboveground. Because the nets were not set higher than 6 m, the forest canopy was not well sampled. The nets were opened before sunrise (0530–0630 hours) and usually were closed at 0900–1000 hours because of windy conditions; frequently, nets were reopened from 1600 to 1830 hours.

In addition to using mist-nets, birds were collected with shotgun or slingshot in an area extending up to 15 km from Concepción that included a variety of habitats (savanna wetland, marsh, riverine, disturbed *cerrado,* second-growth woods, roadside scrub, weedy field, and town). Voucher specimens were made of the birds collected, and they are housed at the Colección Boliviana de Fauna (CBF), La Paz, and the Field Museum of Natural History (FMNH), Chicago.

Visual surveys were made regularly. When not mist-netting, various sites within a 15-km radius of Concepción were visited so that each of the major habitat types was surveyed at least once a week. Although I was unfamiliar with many of the bird species at the beginning of the study, examination of mist-netted birds aided sight-identification in the field. Likewise, my knowledge of vocalizations improved, so I was able to recognize by voice the more common species or those species with distinctive vocalizations. Thus, I became quite familiar with the bird species and was able to record their presence and relative abundance. Nevertheless, it is likely that some secretive or inconspicuous species were missed because I was not completely familiar with vocalizations (Parker, 1991). While surveying the bird communities, I collected general life-history data, including habitat use, foraging behavior, breeding behavior, and social behavior.

In Bolivia, birds were identified with the aid of field guides (Meyer de Schauensee, 1970; Meyer de Schauensee et al., 1978; Dunning, 1982), and those identifications were confirmed by determination of voucher specimens at the Field Museum of Natural History, Chicago. I was not able to collect voucher specimens for all species recorded, but, in most instances, I was able to corroborate sight records with photographs or voice recordings, which are deposited at VIREO, Academy of Natural Sciences, Philadelphia, and the Library of Natural Sounds, Laboratory of Ornithology, Cornell University, respectively. Where no such documentation is available, I list only those sight records that I believe are unequivocable. Although the list of species presented is not complete, it is essentially error-free.

The List and Its Codes

Table 1 presents the systematic listing of 257 species of birds identified in Concepción and vicinity. I have adopted the family and generic sequence and taxonomy used by Remsen and Tray-

lor (1989). An asterisk following the species name identifies those species for which additional information is provided in the text. Listed with each species are eight columns of codes adapted from Terborgh et al. (1984) and Parker et al. (1982). The codes summarize the data collected on seasonality, breeding, relative abundance, habitat use, foraging position, food, sociality, and method of documentation. Blank spaces in the columns indicate insufficient data. The codes are described below and summarized in the key following Table 1.

Seasonal Status

Where the seasonal status is known, four codes are used: P, permanent resident; W, wet-season resident; D, dry-season resident; and T, transient. V denotes species that visited occasionally, and N identifies migrant species that breed in North America. A "?" following one of the codes indicates suspected seasonal status, whereas a "?" alone indicates uncertain status. The numbers refer to the 12 months of the year and, for species other than permanent residents, indicate those months in which the species was recorded. Boldface numbers indicate more than 1 year of data. Some species observed in only a few months may be permanent residents, but rarity or secretiveness of the species resulted in only a few observations. In addition, some species listed as dry-season residents may extend their stay into the wet season, so they are, for example, resident 8 of the 12 months but absent during the months of heaviest rainfall; in all such instances, no breeding activity was observed.

Breeding Status

Where breeding activity was observed, seven codes are used to describe the nature of the data collected: C, copulation; N, nest building; I, incubating; B, brooding; F, carrying food; Y, adult with recently fledged young; and E, female specimen with yolking egg. Although courtship behavior alone is not used as confirmation of breeding in the immediate study area, it does provide indirect evidence of breeding for several permanent resident species. For those species, D indicates that courtship displays were observed. Numbers indicate the month(s) in which evidence of breeding was collected; numbers in boldface indicate 2 years of data. Observations of juvenile birds or enlarged testes in male specimens were not considered adequate evidence of breeding in the immediate study area.

Abundance

Five codes are used to describe relative abundance: C, common, observed daily in moderate to large numbers ($\geq$ 10); F, fairly common, observed daily in small numbers ($<$ 10); U, uncommon, observed once in 3 days; R, rare, observed once in 6 days or less and believed to be a "regular" member of the community; and V, visitor, observed three times or less in a year and not considered a regular member of the community. P, patchy, denotes species that were restricted to a rare habitat; i.e., they would be seen regularly only if particular sites were visited. For patchy species, the abundance code indicates their abundance within a restricted habitat. A "?" indicates uncertain abundance status. The abundance of a number of species varied markedly between seasons or between years. The designations used refer to the maximum observed, and the population fluctuations are described in the text below.

Habitats

The study area was divided into 19 habitat types that the birds appear to distinguish. The habitats are listed in decreasing order of use when a species used more than one type; a maximum of six types is assigned to a species.

- A Agricultural land. Cultivated pasture, cropland, and slash-and-burn plots. Palm trees (*Scheelea princeps*) common; other tree species usually cut.
- Bs *Barbecho* scrub. Low, tangled second-growth vegetation (shrubs and small trees) along roadways and covering abandoned agricultural land.
- Bw *Barbecho* woodland. Second-growth forest of short to medium stature (3–10 m) with a more or less closed canopy.
- C *Cerrado.* Wooded grassland or savanna on well-drained soils; usually used for cattle grazing, but otherwise undisturbed.
- Cd Disturbed *cerrado.* Wooded grassland or savanna near human settlements altered by excessive harvesting of firewood, trash dumping, and cattle grazing. Characterized by

TABLE 1. List of bird species from Concepción, Bolivia, and their status, habitats, and behavior.

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Rheidae								
Rhea americana	P		R	C, Cd	T		S	S
Tinamidae								
Rhynchotus rufescens	P	I (10)	F	C, Cd, Fe	T		S	S
Crypterellus undulatus	P		F	Fi	T		S	S
Podicipedidae								
Tachybaptus dominicus	?:3		R	M	W		S	S
Phalacrocoracidae								
Phalacrocorax brasilianus	V:1, 4, 11		V	R	W		G, S	S
Ardeidae								
*Ixobrychus involucris**	?:4, 7		?	M		I	S	+
Tigrisoma lineatum	P		F	M, Fg	W		S	P
Syrigma sibilatrix	?:1, 4, 5, 8, 11		R	M	W		S	P
Pilherodius pileatus	?:2, 5, 8		R	M, P	W		S	S
Ardea cocoi	P		R	M	W	V	S	P
Casmerodius albus	P		F	M	W		S	P
Bubulcus ibis	P		P/C	M, I, W	W, T	I	G	S
Butorides striatus	P		U	M	W		S	P
Agamia agami	?:5, 8		R	M	W		S	S
Nycticorax nycticorax	?:1, 4, 8		R	M, Fg	W	Fi	S	+
Ciconiidae								
Mycteria americana	V:3, 5		V	I, P	W		G	S
Ciconia maguari	V:7, 11		V	M	W		G, S	P
Jabiru mycteria	V:**6**, **8**		V	M, P, I	W		G, S	S
Cathartidae								
Coragyps atratus	P		C	O (C, Cd), Cd	A	C	G	S
Cathartes aura	P		F	O (C, Cd), Cd	A	C	G, S	P
Sarcoramphus papa	P?:4–6, 10, 11		P/U	O (C)	A	C	S	S
Anatidae								
Cairina moschata	P		R	M, I	W		S	P
Accipitridae								
Pandion haliaetus	V, N:4		V	O			S	S
Chondrohierax uncinatus	?:5		R	C			S	S

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Elanoides forficatus	V:1, 3, 5, **6**, **8**, 9, 11		V	O (C, I)	A	I	G	P
Gampsonyx swainsonii	?:3, 4, 8, 11		R	Cd, C, W			S	P
Elanus leucurus	?:12		R	W			S	S
*Rostrhamus sociabilis**	V:1, **3**, 8, **10**		V	P, M, I	A	Fi	S	P
Harpagus diodon	?:10	E (10)	R	Fi	Sc	I	S	+
*Ictinia mississippiensis**	T, N:3?, 9, **10**, **11**		C	O, C, Cd, Fi	A	I	G	+
*Ictinia plumbea**	T, W:8, **9**-**12**, 1, 3	C (9), I (11), B (10, 11)	C	O, C, Cd, Fi	A	I	G, S	+
Accipiter bicolor	?:3		R	Fi, T	Sc	V	S	+
Asturina nitida	?:5, 7		R	Fd, Bw	Sc		S	S
*Buteogallis urubitinga**	V:9, 11, 12		V	O (Cd)			G	S
Buteogallis meridionalis	P?:4, 5, 8, 9, 11		F	I, M	Sc	V, I	S	P
Buteo magnirostris	P	I (9, 10)	C	Cd, C, W, Bw	Sc	V, I	S	P, V
Buteo albicaudatus	?:11		R	O (C, I)			S	S
*Harpia harpyja**	?:1		R	Fd	C		S	P
Spizaetus ornatus	?:8		R	Fd	C		S	S
Falconidae								
Milvago chimachima	P	C (9)	C	Cd, W, C, T	U, Sc, C, T	I	S	+
Herpetotheres cachinnans	P		U	I, Cd, Fe, A	C		S	P
Micrastur ruficollis	?:11		R	Fd	Sc, C	V	S	+
Falco sparverius	P	C, E (**9**)	F	W, Cd, T, Bs	Sc, C	I, V	S	+
Falco femoralis	W?:12, 1, 3–6		R	Cd, I	Sc, C		S	S
Cracidae								
Ortalis canicollis	P?		F	Rm, Bs	Sc		S	P, V
*Pipile pipile**	P		P/U	Rm	C, Sc	F	S	P
Rallidae								
Aramides cajanea	P		U	Bw, Bs	T	I	S	S
Gallinula chloropus	P		F	M	T, W	I, S	S	S
Porphyrula martinica	P		F	M	T	I, S	S	+
Cariamidae								
Cariama cristata	P		F	C, Cd	T	I, V	S, G?	+
Aramidae								
Aramus guarauna	P		F	M, I	W	Fi	S	+
Charadriidae								
Vanellus cayanus	?:5		P/F	Rs	T	I	S	S
Vanellus chilensis	P?:1, 2, **3**, 5, 10, 11		P/F	Rs, I	T	I	S	S
Pluvialis dominica	T, N:**9**, **10**, 11, 12		F	W, Cd	T	I	G, S	+

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Jacanidae								
*Jacana jacana**	P	Y (6, 8)	F	M	T	I	G	+
Scolopacidae								
Tringa melanoleuca	T, N:8, 9		R	P, Rs	W	Fi	S	P
Tringa flavipes	T, N:7		R	P, Rs	W	Fi	S	S
Tringa solitaria	T, N:**11**		R	P, Rs	W	Fi	S	P
Gallinago paraquaiae	P	D (**2**, **3**, 12)	R	M, I	T	I	G	S
Laridae								
Phaetusa simplex	V:3, 5, 6		V	O (M)	A	Fi	S	S
Columbidae								
Columba speciosa	?:2–4, 11, 12		U	Fi, A	C	S	G	+
Columba picazuro	?:9		R	I	Ts	S	G	S
*Columbina talpacoti**	W:9–4		F	Bs, Cd, C	T	S	G, M	+
*Columbina picui**	D:**3–10**, 11, 12		C	W, T, Cd	T	S	G, M	+
*Geotrygon montana**	?:4		P/?	Fh	U	S	S	+
Psittacidae								
Ara ararauna	P		C	I, C, Cd, Fg	Sc, C	F	G, S	P
Ara auricollis	P		F	Cd, Bw, T, Fd	Sc, C	F	S, G	P, V
*Ara nobilis**	P		F	C	Sc, C	F	G	+
Aratinga acuticauda	D:**5–9**		C	C, Cd, Bw, Fd, T	U, Sc	F	G	S
Aratinga leucophthalmus	P		C	C, I, Fi	Sc	F	G	+
Aratinga aurea	P		C	Cd, Bw, W, T	Sc, C	F	G	+
Pyrrhura molinae	P		F	Fd, Fe	Sc, C	F	G	S
Brotogeris versicolurus	P		C	Cd, I, Fg, T	Sc	F	G	V
Pionus maximiliani	?:**4**, 11, 12		U	Bw	Sc, C	F	G	P
Amazona aestiva	P		?	Fi	Sc, C	F	S, G	V
Amazona amazonica	P		C	Fi	Sc, C	F	S, G	+
Cuculidae								
Piaya cayana	P		U	Rm, Bw, Bs, Fi	Sc, U	I	S	+
*Crotophaga major**	W?:11, 12, 3		P/F	M, Bs			S, G?	S
Crotophaga ani	P		C	W, Cd, Bs, I, M	T, Ts	I	G	+
Guira guira	P		C	W, Cd, Bs	T, Ts	I	G	P, V
Tapera naevia	?:6, 7, 9		R	W, Cd	T, Ts	I	S	S
Tytonidae								
Tyto alba	?:10		R	C			S	S

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Strigidae								
Otus choliba	P?		?	W, Cd, A		I	S	+
Caprimulgidae								
Podager nacunda	D:4, 5, 8, 9, 11		F	T, W, Cd	A	I	G	+
Nyctidromus albicollis	?:4, 11		?	Bw, Bs		I	S	+
Caprimulgus parvulus	?:4		?	W		I	S	+
Hydropsalis brasiliana	?:4, 5		?	Bs, Cd		I	S	+
Trochilidae								
Glaucis hirsuta	?:2, 4		U	Fi, Bw	U	N, I	S	+
Phaethornis subochraceus	P		F	Fd, Bw	U	N, I	S	+
*Eupetomena macroura**	P	D (4), N (9), E (2), B (2)	F	Cd, C	U, Sc	N, I	S	+
Colibri serrirostris	?:9		R	Cd		N, I	S	+
Anthracothorax nigricollis	V?:2, 4		V	C, Bs	U, Sc	N, I	S	+
Chlorostilbon aureoventris	D:**3**, **4**, 5, 8, 9		F	Cd, W, T, Bs	U	N, I	S	+
Thalurania furcata	?:2, 3, 10		F	Fi, Bw, Fh	U	N, I	S	+
Hylocharis cyanus	?:2, 5		R	C, Rm	Sc	N, I	S	+
Hylocharis chrysura	V?:**3**, 4, 11		V	Bs, T, W	Sc, U	N, I	S	+
Polytmus guainumbi	D:3, 6, 9		F	Cd	Sc	N, I	S	+
Trogonidae								
Trogon curucui	P		U	Rm, Bw, Bs, Fd	U	I	S	P
Alcedinidae								
Ceryle torquata	P		F	R, Rm, M	Sc, A	Fi	S	S
Chloroceryle amazona	P		P/U	R, Rm	U	Fi	S	S
Chloroceryle americana	P?		P/U	R, Rm	U	Fi	S	P
Chloroceryle aenea	P?		P/R	R, Rm	U	FI	S	P
Momotidae								
Momotus momota	P		U	Fd	U	I, F	S	+
Bucconidae								
Nystalus chacuru	P		R	C, Cd	Sc		S	+
Monasa nigrifrons	P		U	Fd, Fh, Bw	C, Sc	I	S, G	+
Galbulidae								
Galbula ruficauda	P		F	Bw, Rm, Fd, Fh	Sc, U	I	S, M	+
Ramphastidae								
Pteroglossus castanotis	P		U	C, Bw, Fd	C, Sc	F	S, G	S
Ramphastos toco	P		U	C, Cd, Fi, Fd	C, Sc	F	S	P

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Picidae								
Picumnus minutissimus	P		R	Bw	Sc, U	I	S	S
Melanerpes candidus	P		F	T, W	Sc	I, F	S	+
Melanerpes cruentatus	?:3–5		F	A, Fd, Fh	Sc, C	I, F	S, G	P
Veniliornis passerinus	P	Y (3)	F	Cd, Bs, Bw, C	Sc, U	I	S	+
Colaptes melanochloros	?:4, **9**, 10		U	W, Bw, T	Sc	I	S	+
Celeus lugubris	P		U	Fd	Sc	I	S	+
Drycopus lineatus	P		U	C, Cd, Fi	Sc	I, F	S	+
Campephilus rubricollis	?:2		?	Fd	Sc	I	S	+
Dendrocolaptidae								
Sittasomus griseicapillus	P		F	Fd, Fh	U, Sc	I	S	+
Xiphocolaptes major	?:7		?	Fd	Sc	I	S	+
Dendrocolaptes picumnus	?:2, 3		?	Fd, Fh	U	I	S	+
Xiphorhynchus picus	?:**4**, 12		?	Bw	U, Sc	I	S	+
Xiphorhynchus guttatus	?:2, 11		?	Fd	U, Sc	I	S, M	+
Lepidocolaptes angustirostris	P	Y (3)	F	Cd, Bs, C, Fi	U, Sc	I	S	+
Furnariidae								
Furnarius rufus	P	N (2, **3**, **4**, **9**, **10**), I/B (10, 11, 12), Y (1, 10, 12)	C	T, W, Cd, A	T, U	I	S	+
Synallaxis gujanensis	P		R	Bs, Cd, Fd	U, T?	I	S	+
Poecilurus scutatus	?:7		?	Fd	U	I	S	+
*Phacellodomus rufifrons**	P	N (1, **2**–**4**, 5, **6**, 8, **9**, 10–12), B (12), Y (1)	C	T, W, Cd, A	U, Sc	I	S	+
*Phacellodomus ruber**	?:11		?	Cd		I	S	+
*Xenops rutilans**	?:2		P/?	Fh	U	I	S	+
Formicariidae								
Taraba major	P	Y (4)	F	Bs, W, T, Fi	U, Sc, Sh, T	I	S	+
Thamnophilus doliatus	P	N (1), E (4), Y (4)	F	Bs, Cd, Fi, T	U, Sc, Th	I	S	+
*Thamnophilus schistaceus**	?:2		P/?	Fh	U	I	S	+
Thamnophilus punctatus	P		F	Fd	U	I	S	+
*Dysithamnus mentalis**	?:2		P/?	Fh	U	I	S	+
Herpsilochmus pileatus	?:2, 3, 11		U	Fd	U	I	S, M	+
Formicivora rufa	P	F (2), Y (2, **4**)	F	Bs, Cd	U, Th	I	S	+
Pyriglena leuconota	P		F	Fd	U	I	S	+
*Myrmeciza atrothorax**	?:2, 4		P/F	Fh, Fg	U, T	I	S	+

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Rhinocryptidae								
Melanopareia torquata	P	E (11)	F	Cd, C	U, Ts, T?	I	S	+
Tyrannidae								
Camptostoma obsoletum	?:5, 6, 9		U	Bw, Bs, T	Sc, Sh	I	S	+
*Phaeomyias murina**	P	N (10), I (11)	F	Bs, Cd, C, T	Sc, Sh	I, F	S	+
*Suiriri suiriri**	V:3, 7		V	Cd	U, Sc	I	S	+
Myiopagis viridicata	?:2, 3, 11		U	Fd	U	I	S	+
Elaenia flavogaster	P	N (11), Y (1)	F	Cd, Bs, W, Fg	Sc, Ts	F	S	+
Elaenia spectabilis	T:10, 11		U	Fi	U	I, F	S	+
Elaenia parvirostris	W?:9, 10, 1–4		F	Cd, Bs, W	Sc	F, I	S	+
Elaenia chiriquensis	W?:9, 1		F	Cd, C, Fi	Sc, U	F, I	S	+
Serpophaga subcristata	D:4, 6, 9, 10		U	Bs, W, T	Sc, Sh	I	S	+
Euscarthmus melacoryphus	?:9		R	Cd	Ts	I	S	+
*Mionectes oleagineus**	?:2		P/?	Fh	U	F	S	+
Leptopogon amaurocephalus	P		F	Fd, Fh	U, Sc	I	S, M	+
Corythopis delalandi	?:11		R	Fd		I	S	+
Myiornis ecaudatus	?:6, 9		R	Fd	U	I	S	S
*Hemitriccus margaritaceiventer**	P	N (8–10)	F	Bs, Fi, Cd	U, Th, Ts	I	S	+
Tolmomyias sulphurescens	?:2		U	Fd	U	I	S, M	+
Myiophobus fasciatus	D:3–9		F	Bs, Cd, T	U, Sh	I	S	+
Empidonax alnorum	V, N:4		V	Bs	U	I, S	S	+
Lathrotriccus euleri	V:2, 4		V	Bw, Fd	U	I, F	S, M	+
Cnemotriccus fuscatus	?:3, 11		U	Bw, Fd	U	I	S	+
Pyrocephalus rubinus	D:**4**-**10**, 11		F	Cd, W, Bs, T	Sc, C	I	S	+
*Xolmis cinerea**	P	D (10)	U	W, Cd	Sc, C	I	S	+
*Knipolegus hudsoni**	D:**5**, **6**, **9**		U	Cd, W, T	Sc, Sh	I, S	S	+
Hymenops perspicillata	V:6		V	Cd	U	I	S	S
Fluvicola pica	V:4		V	P, M	U, T	I	S	+
Satrapa icterophrys	V:2, 6, **9**		V	W	U	I	S	S
*Machetornis rixosus**	P	C (10), N (10), B (10), Y (1)	C	W, T	T, U, C	I	S	+
Casiornis rufa	P		F	Fd, Bw	Sc, U	I	S, M	+
Sirystes sibilator	V:1		V	Bw	C	I	S, G	S
Myiarchus tuberculifer	?:4		R	Bw	Sc		S	S
Myiarchus swainsoni	T:9, **10**, 11		F	C, Cd, Fi	Sc, U	I, F	S	+
Myiarchus ferox	W:**10**, **11**, 2, **3**, 4		F	C, Fe	Sc, Ts	I, F	S	+
Myiarchus tyrannulus	?:1–4, 7		F	Cd, W, Bw, Fe	Ts, Sc	I, F	S	+
*Pitangus sulphuratus**	D:**3**-**6**, **8**, **9**, 10, 11		F	Cd, W, T, Bw	Sc, U	I, F	S	+

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Megarynchus pitangua	V:3, **4**		V	Fe, Bs	Sc, C	I, F	S	+
Myiozetetes cayanensis	D:3–5, 8, 9		U	Rm, Fg, Bw, Bs	U	I, F	S, G	+
Myiozetetes similis	?:3, 4		U	Rm, Fg, Fs	Sc, C	I	S, G	S
Myiodynastes maculatus	W:**9**-**12**, 2, **3**, 4	E (11)	F	Bw, Bs, Fi, C	Sc	I, F	S	+
Empidonomus varius	W:11, 12, 1, 3, 4		U	Fe, C	U, Sc, C	I	S	P
Empidonomus aurantioatrocristatus	T:3, 10, 11		R	I, M, C	Sc	I	S	+
*Tyrannus albogularis**	W:**9**-**4**	N (9, 10)	C	Cd, W, T, C	Sc, C	I	S, M	+
Tyrannus melancholicus	P	D (**9**, **10**)	C	Cd, W, T, C	Sc, C	I, F	S, M	+
*Tyrannus savana**	T:**2**, **3**, 4, **9**-**11**		C	W, T	C, A	I, F	S, G	+
Tyrannus tyrannus	T, N:10, 11		R	W	U	I	S	S
Pachyramphus polychopterus	?:2–4		R	Bw, Fi, Cd	Sc, U	I	S	+
Tityra semifasciata	?:6, 8, 9		U	Fe	Sc, C	F	S, G	S
Tityra inquisitor	?:5, 8		U	Fe	Sc	F	S, G	S
Cotingidae								
Gymnoderus foetidus	?:1		R	Fd	C		S, G	S
Pipridae								
Pipra fasciicauda	P		F	Fd, Fh, Bw	Sc, U	F	S	+
Hirundinidae								
Tachycineta albiventer	?:11		P/C	Cd, W	A	I	G	S
*Progne tapera**	W:**9**-**11**, 12, **1**-**3**, 4	B (**1**)	C	T, W	A	I	G	+
*Progne subis**	T, N:1, 9, 12		C	T	A	I	G	+
Progne chalybea	P	E (9, 11)	C	T	A	I	G	+
Alopochelidon fucata	V:3, 4		V	T, W	A	I	G	S
Stelgidopteryx ruficollis	P?		U	Rm, M, W	A	I	G	+
Hirundo rustica	T, N:2, **3**, 5		R	W	A	I	G	S
Troglodytidae								
*Campylorhynchus turdinus**	P	N (4, 11, 12), Y (12)	F	W, A, T, Bw	Sc, C	I	S	+
Thryothorus genibarbis	V?:2–4		V	Bs, Fd, Fh	U, Th	I	S	+
Thryothorus guarayanus	P		F	Bs, Bw, Fi, Fd	U, Th	I	S	+
Troglodytes aedon	P	Y (**11**, 12)	F	Cd, Bs, Fi, T	U, Sc, Ts	I	S	+
Donacobius atricapillus	V:9		V	M	U	I	S	S
Sylviinae								
Polioptila dumicola	V?:6, 9		V	Cd	Sc, C	I	S, M	S

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Turdinae								
Catharus fuscescens	V, N:11		V	Fd	U	I	S	+
Turdus amaurochalinus	D:4, **5-9**, 10		F	Bs, Bw, Cd, T, Fd, Fh	Sc, U, Ts, T	I, F	S	+
Turdus hauxwelli	V:2, 4, 10, 11		V	Fd, Fi	U	I, F	S	+
Mimidae								
Mimus saturninus	P	Y (1)	U	W, I	T, U, Ts	I	S, G	+
Mimus triurus	D:2, 3, 5, 6, 8, 9		U	W, Cd, T	T, U, Ts	I	S	S
Corvidae								
Cyanocorax cyanomelas	P	Y (2)	C	Cd, Bs, Fe	Sc, C	F, I	G	+
Cyanocorax chrysops	P	E (10)	F	Bw, Fi, Cd	U, Th, Ts	F, I	G	+
Vireonidae								
Cyclarhis gujanensis	D:4–9		U	Bs, Fi	Sc, C	I	S	+
Vireo olivaceus	P	E (11)	F	Fd, Fi, Bw, Bs, T	Sc, C	I	S, M	+
Motacillidae								
Anthus lutescens	?:5		R	Rs	T	I	G	S
Emberizinae								
Ammodramus humeralis	P		F	Cd, W	T, U	I	S, G, M	+
Sicalis flaveola	V:11		V	Cd	U		S	+
*Sicalis luteola**	V:10		V	W			G	S
Emberizoides herbicola	P		F	Cd	T, U	I	S, M	+
*Volatinia jacarina**	D:**3**, **4**, 5, 6, 9, **10**, **11**		F	Cd, W	U	S	S, G	+
Sporophila plumbea	P	F (2)	U	Cd, W	U	S	S	+
*Sporophila caerulescens**	T:4, 5, 9, **11**		R	Cd, W	U	S	S, M	S
*Sporophila nigrorufa**	?:4, 11		R	I	U, Ts	S	S	P
*Sporophila minuta**	T:3?, 9		R	Cd, W	U	S	M	+
*Sporophila ruficollis**	T:3?, 9		R	Cd, W	U	S	M	S
*Sporophila hypochroma**	T:3?, 9		R	Cd, W	U	S	M	S
*Oryzoborus maximiliani**	P	I (12), B (5, 8), Y (9, 12)	P/F	M	Sc, U	S	S	+
*Oryzoborus angolensis**	P	I (12)	U	M, Bs	U	S, I	S	+
*Coryphospingus cucullatus**	D:3–5, **6-10**, 11, 12		C	Cd, Bs, Bw, T	Ts, U, T	S, I	S, G	+
Paroaria gularis	?:5, 7		P/U	Rm	U	I	S	S
Cardinalinae								
Pheucticus aureoventris	D:**5**, **6**, 7–10		U	Bs, Cd, Fd	U, Sc, Ts	S, I	S	+

TABLE 1. *Continued.*

Species	Seasonal status	Breeding status	Abundance	Habitats	Foraging position	Food	Sociality	Documentation
Saltator maximus	V?:**3**, 4		V?	Bw	Sc	I, F	S	+
Saltator atricollis	P	Y (**1**, 2, **3**)	F	Cd, W	U, T?	I	S, M	+
Cyanocompsa brissonii	V?:11		V	Fi	Sc	S	S	+
Thraupinae								
Schistochlamys melanopis	P	Y (3, 5)	U	Cd, Bs	Ts, Sc	F, I	S	+
Neothraupis fasciata	P	C (10)	R	Cd	Ts, U, Sc	I	S, M	+
*Cypsnagra hirundinacea**	P	N (9), I (10), B (10), Y (11)	F	Cd, C	Ts, Sc, C	I	S, M	+
Cissopis leveriana	?:10		R	Fd			S	S
Thlypopsis sordida	?:9		?	W, Cd	Ts	I	S	S
Hemithraupis guira	?:2, 3, 5–7, 9		U	Fd, Fh	Sc, C	I	S, M	S
Eucometis penicillata	P		F	Fd, Fh	U	I, F	S	+
Tachyphonus luctuosus	?:6		?	Fd	Sc, C	I	M	S
*Habia rubica**	?:2		P/FC	Fh	U	I	S	+
Piranga flava	P	F (3)	U	C, Cd	Sc, C	I	S	+
Ramphocelus carbo	P	N (8), E (11), Y (**1**–3)	C	Bs, Bw, Cd, Fi	U, Sc	F, I	S, G	+
Thraupis sayaca	P	E (9), F (1)	C	Bs, Cd, W, T, C	Sc, C	F, I	S, G	+
*Thraupis palmarum**	P	N (9, 11), I (9, 10), B (10, 11)	F	I, Fe, Bs, T	Sc, C	F, I	S	+
Euphonia chlorotica	P		U	Bw, C Cd, T, Fd	Sc, C	F	S	+
Dacnis cayana	P	Y (4)	R	Cd, Bs, Bw	C, Sc	N, I	S	S
Cyanerpes cyaneus	?:4		?	Bw	C	N, I	S	S
Parulidae								
Parula pitiayumi	P		F	Fd, Bw, Bs, C, Fh	Sc, C	I	S, M	V
Geothlypis aequinoctialis	P	Y (2)	U	M, I, W, Fh	U	I	S	V
Basileuterus flaveolus	D?:4–6		U	Bw, Fe	U	I	S	+
Basileuterus culicivorus	P		F	Fd, Fi	U, Th	I	S, M	+
Conirostrum speciosum	?:6		U	Fd	Sc, C	I	M	S
Icteridae								
Psarocolius decumanus	P		F	Fd, Fi	Sc, C		S, G	S
Cacicus cela	P	B (11)	P/U	Rm, Bw	Sc, C		G	P
Icterus cayanensis	P	N (11)	U	C, Bs, Bw, Fe	Sc	F	S	+
Icterus icterus	P		R	T, W, Fg	Sc, C	I, N	S	+
*Leistes superciliaris**	V:**5**, 6, 9		V	Cd, W	T	I	G	+
Gnorimopsar chopi	P	Y (11)	F	I, W, T	Sc, C, T	S, I	G	+
Molothrus bonariensis	?:9, 10		F	W, T	Sc, T	I	G	S

Table 1. *Continued.*

Key to symbols: Seasonal status: P = permanent resident; W = wet-season resident; D = dry-season resident; T = transient; V = visitor; N = migrant from North America; ? = uncertain seasonal status; 1–12 = months when observed (boldface indicates more than 1 year of data).

Breeding status: C = copulation; N = nest building; I = incubating; B = brooding; F = carrying food; Y = adult with recently fledged young; E = female specimen with yolking egg; D = courtship display; 1–12 = months when breeding data collected (boldface indicates 2 years of data).

Abundance: C = common, daily in moderate to large numbers; F = fairly common, daily in small numbers; U = uncommon, 1/3 days; R = rare, 1/6 days or less; V = visitor; P = patchy, restricted to a rare habitat; ? = uncertain abundance status.

Habitats: A = agricultural land; Bs = *barbecho,* second-growth scrub; Bw = *barbecho,* second-growth woodland; C = *cerrado;* Cd = disturbed *cerrado;* Fd = dry semideciduous forest; Fe = forest edge; Fg = gallery forest; Fh = semihumid semideciduous forest; Fi = forest island; I = inundated savanna; M = marsh; O = overhead airspace; P = roadside pools; R = river; Rs = river shore; Rm = river margin; T = town; W = weedy field or pasture.

Foraging position: A = aerial; C = canopy; Sc = subcanopy; Sh = shrubbery; T = terrestrial; Th = thicket; Ts = stands of trees and shrubs in savanna; U = understory; W = water.

Food: C = carrion; F = fleshy fruits; Fi = fish and/or aquatic invertebrates; I = insects and other terrestrial invertebrates; N = nectar; S = seeds and dry fruits; V = vertebrates, excluding fish.

Sociality: S = solitary, pairs, or family groups; G = gregarious; large congregations or flocks of the same species; M = mixed-species assemblages or flocks.

Documentation: + = specimen; S = sight record positive; V = voice recording; P = photographic record.

*Additional information in text.

reduced tree density and increased abundance of annual weeds, shrubs, and dicot forbs.

Fd Dry semideciduous forest. Seasonal forest of moderate stature; canopy height 12–18 m with emergents to 25 m.

Fe Forest edge. The margin of forest in the transition to *cerrado.*

Fg Gallery forest. Forest of short to medium stature (6–15 m) bordering water courses in *cerrado* and inundated savanna; periodically inundated.

Fh Semihumid semideciduous forest. Seasonal forest of moderate stature at the base of the Serranía de San Lorenzo; canopy height 12–18 m with emergents to 25 m.

Fi Forest island. Isolated patches of dry semideciduous forest in *cerrado.* Variable in area (1–100 ha) and canopy height (10–20 m).

I Inundated savanna. Wetlands (valley-side *campos* and valley bottoms) ranging from permanently humid to seasonally inundated grasslands. Trees scarce or absent; fluctuating water levels.

M Marsh. *Laguna;* permanently inundated wetland with less than 50% plant cover; trees absent; dominated by *Eleocharis fistulosa* (Cyperaceae), *Desmodium cajanifolium* (Leguminosae), and *Leersia hexandra* (Gramineae). Variable in area from 10 to 500 m^2; usually surrounded by *cerrado.*

O Overhead airspace. Designation for species that spend much of the day in the air; some species were only observed flying. Habitat code in parentheses identifies type of vegetation over which the species was observed.

P Roadside pools. Small (4–25 m^2) artificial ponds, resulting from road-building activity, that are permanently or seasonally inundated; and water-filled potholes that develop in the roads during the rainy season.

R River. Designates species that swim in or catch their prey in rivers.

Rs River shore. Grass or sand banks along the edge of rivers.

Rm River margin. Designates species that occupy edge vegetation along rivers in semideciduous forest or second-growth woods.

T Town. Concepción.

W Weedy field or pasture. Small plots of cleared land near inhabited areas generally maintained for livestock grazing. Palm trees (*Scheelea princeps*) common; other tree species usually cut.

Foraging Position

Designations are based solely on direct observation and mist-netting. Where a species foraged in more than one strata, the codes are listed in decreasing order of occurrence.

A Aerial. Species that forage on the wing.
C Canopy. The highest treetops.
Sc Subcanopy. Above eye level but below the crowns.
Sh Shrubbery. Species seen in low vegetation of inhabited areas.
T Terrestrial. Foraging mainly or exclusively on the ground.
Th Thicket. Species that forage in low, tangled or thorny vegetation.
Ts Trees and shrubs. In *cerrado* or weedy field, species that frequent small dense stands of trees and shrubs.
U Understory. Above the ground to eye level.
W Water. Species that take food from the water.

Food

Diet assignations are based entirely on direct observation and stomach content examination. Where stomachs contained more than one food type, the codes are listed in order of decreasing abundance.

C Carrion.
F Fleshy fruits.
Fi Fish and/or aquatic invertebrates.
I Insects and other terrestrial invertebrates.
N Nectar.
S Seeds and dry fruits (caryopses and achenes).
V Vertebrates, excluding fish.

Sociality

Gregariousness in tropical bird communities is well known. Although flocking behavior seems to be less prevalent in semideciduous forest and *cerrado* than in evergreen forest, mixed-species and single-species flocking were observed. Some species exhibit more than one type of sociality; for example, a species may forage in mixed-species flocks as well as alone or in a family group, or a species may migrate in large single- or mixed-species flocks but forage alone when not migrating.

S Solitary. Species that forage as individuals, in pairs, or in small family groups.
G Gregarious. Species commonly seen in single-species flocks.
M Mixed-species flocks. Species that forage in groups containing two or more species.

Documentation

"+" identifies species for which voucher specimens were collected. All other species listed were positively identified after repeated sightings. Where possible, sight records, S, are corroborated with voice recordings, V, and/or photographs, P.

Noteworthy Observations

New Record for Bolivia

Ara nobilis—This macaw was seen regularly in *cerrado,* usually in flocks of 6–12 individuals. Its abundance may be underestimated because, in flight, it was difficult to distinguish from the common parakeet *Aratinga leucophthalmus.* One specimen (FMNH 334958) taken on 2 November 1985 in Concepción represents the first for Bolivia. Sight records of the species have been made in extreme northeastern Dpto. Santa Cruz (J. Bates, unpubl.) and in central (Remsen & Ridgely, 1980) and northeastern Dpto. Beni (Parker & Rocha, 1991). It has been recorded throughout central and eastern Brazil north of Paraná, except in humid forest regions, and from eastern Venezuela, Guyana, and Surinam (Meyer de Schauensee, 1966, 1970; Meyer de Schauensee et al., 1978). Sight records from southeastern Peru (Graham et al., 1980), along with the Beni and Santa Cruz records, suggest that this species is widespread in the open habitats of northern and eastern Bolivia.

New Records for Departamento Santa Cruz

Ixobrychus involucris—This bittern was seen only once. In July 1985 an individual was encountered standing along a marshy stream near Concepción. One specimen (FMNH 334903), captured by hand by a local youth along the same stream on 20 April 1986, represents the first record for Dpto. Santa Cruz. The species has been recorded in southeastern Brazil, Uruguay, Paraguay, and northern Argentina and Chile, and in northern South America in Colombia, Venezuela, Guyana,

and Surinam (Meyer de Schauensee, 1966). The only previous record from Bolivia is from Dpto. Tarija (Salvadori in Remsen & Traylor, 1989).

Ciconia maguari—A single sighting of this stork is the first record for Dpto. Santa Cruz. On 28 November 1986 an individual foraged in a small marshy reservoir, 5 km south of Concepción. In Bolivia the species previously has been recorded in Dptos. Beni, Cochabamba, and Tarija. It occurs from Colombia to the Guianas and eastern Brazil, south to Bolivia, Chile, and Argentina (Meyer de Schauensee, 1966).

Micrastur ruficollis—This forest-falcon is recorded from Ecuador to the Guianas, south to Bolivia and northern Argentina (Meyer de Schauensee, 1966). It previously has been recorded in Bolivia from Dptos. Pando, La Paz, and Cochabamba. A specimen (FMNH 334920) collected on 22 November 1985, in semideciduous forest near Rancho Zapocoz, represents the first for Dpto. Santa Cruz; it was the only record of this secretive species from the study area.

Tyrannus albogularis—This kingbird occurs throughout much of Amazonia (Meyer de Schauensee, 1966). In Colombia, it seems to be a winter resident recorded May–late August (Hilty & Brown, 1986). In Bolivia it has been recorded November–December in savanna in northern Dpto. Beni (Remsen, 1986) and in October in gallery forest on the Serranía de Huanchaca, northeastern Dpto. Santa Cruz (J. Bates, unpubl.). Near Concepción, the species was a breeding, wet-season (summer) resident. During spring migration it was common in undisturbed *cerrado,* but during summer it was seen most frequently in disturbed *cerrado* and weedy fields, and in town. Migrant *T. albogularis* and *T. melancholicus* were seen in mixed flocks during spring and fall, when the two species were equally abundant. In December and January, *T. albogularis* outnumbered *T. melancholicus* by a ratio of about 10:1. Four specimens (FMNH 335276–335279) mist-netted in *cerrado* in November 1985 represent the first for Dpto. Santa Cruz.

Progne subis—This North American migrant has been recorded in Guyana, Surinam, Venezuela, and Colombia south to northern Bolivia and southeastern Brazil (Meyer de Schauensee, 1966), and Remsen et al. (1987) added records for Bolivia from Dptos. Cochabamba and Chuquisaca. The six specimens (FMNH 335322–335324, 335326, 335327; CBF 01383) collected near Concepción represent the first for Dpto. Santa Cruz. The species was not resident throughout the wet season. Small flocks were seen in September, but none were recorded in October or November. During December and January large flocks passed through in waves. For example, in the first week of January 1987, flock size averaged 1,000 individuals, the following week flocks of 5,000–8,000 were common, and in the third week flock size again averaged 1,000. On 13 January 1987, a flock of 6,000–7,000 birds formed a kettle while moving north over Concepción.

Oryzoborus maximiliani—Only one or two pairs of this rare species were seen, and all observations were made along a disturbed marshy stream at the edge of Concepción. A permanent resident in the area, it was observed at various stages of the breeding cycle (see below). The species was recorded previously in northern Bolivia in Dpto. Beni (Bond & Meyer de Schauensee, 1942). The single specimen (FMNH 335374) collected represents the first for Dpto. Santa Cruz. The range of this seed-finch includes Nicaragua and Panama; parts of Colombia, Ecuador, Peru, and Venezuela; Guyana and French Guiana; and lower Amazonian Brazil southward in eastern and southern Brazil (Hilty & Brown, 1986; Ridgely & Tudor, 1989).

Species from Semihumid Forest

The semihumid semideciduous forest at the base of the Serranía de San Lorenzo was sampled only briefly. Nonetheless, it is significant that six species collected in this forest were not recorded in the more widespread dry semideciduous forest. Four of those species (*Geotrygon montana, Thamnophilus schistaceus, Mionectes oleagineus,* and *Habia rubica*) are listed by Remsen and Traylor (1989) as Amazonian species: species recorded from "Amazonian lowland habitats of northern Bolivia." *Dysithamnus mentalis* is reported by these authors as previously recorded only from humid and semihumid forest and second-growth habitats of the eastern foothills and slope of the Andes. The sixth species, *Xenops rutilans,* has been recorded in Bolivia in both Amazonian and non-Amazonian lowland habitats and from the humid eastern slope of the Andes (Remsen & Traylor, 1989). These few data indicate that this patch of semihumid forest, and probably others in southeastern Chiquitanía associated with the Serranía de Santiago, Serranías de Sunsas, and Serranías de Chiquitos, support species not found in the dry forest typical of the region.

Rare Species and Occasional Visitors

Rostrhamus sociabilis—Recorded occasionally in the study area, this kite was seen commonly in January and March at artificial ponds along the road to Santa Cruz 125–200 km southwest of Concepción. On 15 March 1987, when the species was uncommon in the Concepción area, as many as one kite per kilometer was seen along the Santa Cruz road. Most kites seen near Concepción were adult females or juveniles, but adult males were common near Santa Cruz.

Buteogallis urubitinga—Flocks of this hawk were seen four times during spring. On 9 September 1985, when Concepción was blanketed in dense fog, a flock of 25 birds circled low (5 m) over *cerrado* as it moved south. Later on the same day, a flock of 10 was seen. A kettle of 150 individuals was seen moving south on 25 September 1986, and on 29 November 1986 a flock of 11 was seen.

Harpia harpyja—One record is based on the remains of a hunter-killed individual shot January 1987 in low forest, 30 km north of Concepción.

Pipile pipile—Subspecies *P. p. grayi* is verified by photograph. This guan was restricted to the few rivers bordered by tall forest, such as the Río Zapocoz on Estancia Las Madres and the Río Urugayitos ca. 30 km northeast of Concepción.

Phacellodomus ruber—A single specimen (FMNH 335095) of this furnariid was collected on 3 November 1985, in disturbed *cerrado* on Estancia Las Madres. Although an uncommon species, the lack of sight records may reflect confusion with the similar and more common *P. rufifrons.*

Myrmeciza atrothorax—This antbird was common in semihumid seasonal forest on Estancia Las Maras in February 1987 but was recorded elsewhere only once. On 4 April 1987, near Concepción, a male foraged on muddy ground in gallery forest.

Suiriri suiriri—*S. s. suiriri* and *S. s. affinis* have been treated as conspecifics (Zimmer, 1955; Meyer de Schauensee, 1966) and as separate species (Short, 1975). Here they are considered conspecifics following Traylor (1982). Both subspecies were collected near Concepción, where, based on the small number of records, they were casual visitors. Four *suiriri* were collected on 5 July 1985 in heavily disturbed *cerrado.* One *affinis* was collected in similar habitat on 23 March 1987. This is the second record of *affinis* from eastern Bolivia (Parker & Rocha, 1991); it previously has been recorded in northwestern Dpto. Beni (Glydenstolpe, 1945) and is widespread in Brazil. *Suiriri* has been recorded from southeastern Bolivia, Paraguay, Uruguay, and northern Argentina. In northeastern Paraguay and adjoining Mato Grosso, the population is composed of intergrades between *suiriri* and *affinis* (Traylor, 1982).

Sicalis luteola—A single sight record of this yellow-finch was made on 1 October 1986 when a flock of about 200 was seen in a weedy field on Estancia San Josecito, ca. 4 km northwest of Concepción. The winter movements of yellow-finches breeding in southern Brazil, Uruguay, and Argentina have not been described in detail, but the species is known to migrate northward (Ridgely & Tudor, 1989).

Sporophila nigrorufa—Described by Ridgely and Tudor (1989) as "rare and virtually unknown in life," this seedeater has been recorded previously from "extreme e. Bolivia (Chiquitos in e. Santa Cruz) and extreme sw. Brazil." In the vicinity of Concepción the species was recorded rarely only during spring and fall. In late November 1986, five males and two individuals in female or juvenile plumage were seen in a dry, seasonally inundated savanna where they foraged in small islands of trees and shrubs growing on termite mounds. On 7 April 1987 one male was seen foraging in shrubbery at the edge of an inundated savanna. This species was not identified in the transient mixed-species *Sporophila* flocks. In southwest Brazil, Willis and Oniki (1990) recorded *S. nigrorufa* only in summer, when it replaced *Sicalis luteola, Sporophila* spp., and other granivorous birds.

Seasonality and Abundance

The seasonal designations used refer to the seasons as they occur in the Southern Hemisphere (i.e., Spring = September–December, summer = December–March, fall = March–June, winter = June–September). The wet, or rainy, season occurs from September/October–March/April.

At least 78 of the species recorded are not year-round residents (Tables 1 and 2). Designation of species as long- or short-distance migrants is based, in part, on previous accounts of migratory behavior. Where such information is lacking, or is in strong disagreement with my observations, the designation is based on data from this study.

The majority (68%) of the migrant and occasional visitor species are passerines (53 species in 8 families of passerines; 25 species in 13 families

of nonpasserines). North American species account for 11 of the migrants. Of the South American migrants, 18 species are dry-season residents, 11 are wet-season residents, and 8 are transient during migration (March–April and September–October). Three species are partial migrants (i.e., part of the population is migratory and part remains in the area year-round).

Ictinia mississippiensis—This kite, which breeds in North America, passed through the area in large numbers en route to wintering grounds farther south (Davis, 1989). The first published record of the species in Bolivia was based on a band-return from a hunter-killed bird in Prov. Velasco (Shaw & Maxwell, 1988). Four specimens (FMNH 334914, 334916, 334917; CBF 01385) taken near Concepción in October 1986 represent the first for Bolivia.

Ictinia plumbea—Some individuals were resident during the wet season, while others occurred only as transients (Davis, 1989). Migrants were present in the area from late August to mid-November, whereas breeding birds were seen through early March. *Ictinia plumbea* frequently associated with *I. mississippiensis* in mixed flocks that foraged over *cerrado* and roosted in gallery forest and forest islands.

Columbina talpacoti—This ground-dove was a wet-season resident, but its abundance varied yearly. It was rare to uncommon during the 1985–1986 wet season but fairly common during the 1986–1987 season. Although small flocks occasionally were seen in *cerrado,* the species was encountered most frequently on dirt roads through second-growth scrub. The period of residency of *C. talpacoti* overlapped with that of *C. picui,* and it was not uncommon to see mixed flocks of the two species in September, late April, and May.

Columbina picui—Resident during the dry season, most individuals left the area in spring. A few were seen in November and December, but there was no evidence of breeding.

Crotophaga major—The status of this ani is uncertain because it was encountered only four times: two individuals on 21 November 1986, one on 4 December 1986, and four (a family group?) on 7 and 20 March 1987. All observations were made at the same site, a heavily overgrown area of inundated second-growth scrub. If the species is a wet-season resident, it is rare with a patchy distribution.

Knipolegus hudsoni—Resident only during the dry season; males in black plumage were never seen. Two male specimens (FMNH 335232, 335233) taken on 12 and 15 September 1985 had plumage similar to that of the female; both had fully ossified skulls.

Pitangus sulphuratus—This tyrannid was not a permanent resident in the area. It was not seen or heard from December to mid-March, although it was fairly common during that period in the city of Santa Cruz, 200 km southwest of Concepción.

Tyrannus savanna—This flycatcher was transient during spring and fall migrations. Abundance varied among years: very common in spring 1985, fairly common in fall and spring 1986, and rare in fall 1987.

Volatinia jacarina—This grassquit was more abundant in spring than in fall. It migrated in single-species flocks that were usually small (< 25) but occasionally numbered 50–100. The majority of specimens collected had moderate to very heavy body fat and moderate to heavy molt.

Sporophila Species—Migrating mixed-species flocks of seedeaters were seen mainly in spring (September). In fall 1986 no migrating *Sporophila* flocks were seen, and in fall 1987 only a few small flocks were seen over a 7-day period in late March–early April. In spring, flock sizes ranged from 50 to 100. Most individuals in the spring flocks were females or juveniles, but males of the following species were identified: *S. caerulescens, S. ruficollis, S. hypochroma,* and *S. minuta.* No adult males were seen in fall. The flocks were observed only in weedy fields and heavily disturbed *cerrado. Sporophila caerulescens* usually was seen in mixed-species flocks; however, on 27 April 1987, a single-species flock of 15 individuals (5 males, 10 females and juveniles) was seen in a small tree in a weedy field.

Coryphospingus cucullatus—The abundance of this migrant finch varied markedly between years. Very common from June–September 1985, it was only fairly common during the 1986 dry season. Adult female and juvenile birds arrived in late March–early April, whereas adult males arrived in late April. Although most individuals left the area by early November, a few could be seen rarely into December. There was no evidence of breeding in the study area; however, D. Willard collected a female with a brood patch (FMNH 334587; ovary 7 × 5 mm, ova 2 mm) on 5 November 1987, near San Jose de Chiquitos, ca. 225 km southeast of Concepción.

Leistes superciliaris—This icterid passed through the area in flocks of 25–50 individuals in fall (May) but was quite rare during spring. No individuals were observed in the study area in spring 1985, and only a few small flocks were seen in September

1986. Near the city of Santa Cruz, however, flocks of 10–30 of these blackbirds were seen in August and October 1985.

Breeding Behavior

Although breeding status was not determined for all species listed, the data in Table 1 indicate a well-defined breeding period between September and March, coincident with the rainy season and an increase in insect abundance. Only two species did not follow the pattern: *Jacana jacana* and *Oryzoborus maximiliani* (see below). Although several species (*Furnarius rufus, Phacellodomus rufifrons,* and *Campylorhynchus turdinus*) were seen building nests after March, no fledglings of those species were seen between April and the beginning of the next breeding season in September.

Jacana jacana—The breeding behavior of jacanas varied between habitats. At two large (300–500 m^2) natural marshes in the study area, jacanas with young were seen in June and August. At small (10–25 m^2) artificial ponds along the road to Santa Cruz (115–200 km southwest), young were recorded in January, March, and December. Marsh birds usually were seen with one to two young, whereas at roadside ponds adults regularly were accompanied by three to four young.

Jacanas were more common on artificial impoundments than on natural marshes. On the marshes near Concepción, no more than 10 adults were recorded, whereas on the much smaller artificial ponds as many as 15 adults were seen.

Further study is needed to determine which habitat characteristics influence the breeding and abundance of jacanas. Artificial impoundments (roadside ponds and small reservoirs) are deeper than marshes; they can support a dense growth of floating vegetation (e.g., *Pistia*), but there is little emergent vegetation. Marshes, on the other hand, may be as much as 50% vegetated with emergent plants, but floating species are rare or lacking.

Eupetomena macroura—On 4 September 1985 in disturbed *cerrado,* an individual was seen carrying plant down. On 14 February 1986, a nest with one young (FMNH 334989) was found in a *Curatella americana* tree in *cerrado.* The nest was similar to that described by Ruschi (1986); it was cup-shaped and constructed primarily of plant fibers, grass, and spider webs. The nest was supported by the fork of a branch, 0.5 m from the trunk and 2 m above the ground.

On 7 April 1987, at approximately 0700 hours, what appeared to be courtship behavior was observed. Two individuals flew up to a patch of tall shrubbery in inundated savanna and, while one bird perched on an exposed branch with its tail and wings spread, the other hovered about 10 cm directly above it. With its head held more or less stationary, the second individual twirled its body in a horizontal circle. The display lasted about 10 sec. Later, a different display was performed. The bird flew straight up from the vegetation to 3–5 m above the shrubbery, where it hovered briefly and then flew horizontally or vertically 0.25–0.5 m, when it again hovered briefly before rapidly changing position. This sequence was repeated for about 20 sec before the bird flew off. A second individual was not seen during the display. Ruschi (1986) described similar behavior as courtship display preceding copulation and nest building.

Phacellodomus rufifrons—This thornbird was found only near human habitation, and its large hanging stick nests were usually built in moderate to tall trees in weedy fields and pastures. Breeding behavior was similar to that described for the species in Venezuela (Skutch, 1969). In March 1986 a pair was seen building a new nest using sticks from a nest that had been active September–December 1985; the nests were in the same tree, 10 m apart. On 4 April 1986, a pair used sticks from the "new" nest to construct another in a small tree 100 m away. Skutch (1969) observed similar behavior by a pair that lost two broods from the same nest and then built a new nest nearby, using sticks from the older nest.

Phaeomyias murina—A nest of this flycatcher was found in *cerrado,* on 29 October 1985, on Estancia Las Madres. As described by Cherrie (1916) and Haverschmidt (1968, 1970), the nest is an open cup composed of plant material, primarily grasses in this instance. The nest was supported on the fork of a branch about 0.75 m from the trunk and 3.5 m above the ground in a tree 4 m tall. The nests described by Haverschmidt (1970) were "thickly lined with feathers," but this nest contained only two small feathers. On 29 October, a single green psittacid feather was added to the cup lining. The next day the female added another psittacid feather and then sat on the nest for 10 min, laying one small ivory-colored egg. On 1 November, the nest contained two eggs; no other eggs were added. These data conform with Haverschmidt's (1970) report of eggs laid on alternate days and a clutch size of two. It was not possible to determine if both sexes incubated but when one bird was on the nest, a second bird usually was

seen nearby. The eggs were incubated in the early morning and late afternoon, and all day when raining; however, on sunny days when temperatures could reach 35°C, the attending bird shaded the eggs from about 1200 to 1700 hours by perching on the rim of the nest with its wings spread. The result of the nest is unknown because I left the site before the eggs hatched.

Hemitriccus margaritaceiventer—The nest and eggs of this tody-tyrant in Colombia have been described by Todd and Carriker (1922). On 11 September 1985, an individual began to build a nest in thorny second-growth scrub along a footpath at the edge of Concepción. Two birds were seen at the site but only one, with duller plumage, appeared to be constructing the nest. Spider webs had been strung between two thorns about 10 cm apart on a leafless horizontal branch, 0.75 m above the ground. When the bird arrived with grass in its bill, it perched on the branch and, leaning over forward and occasionally upside down, stuck the grass to the web material with jabbing motions. Long (10–20 cm) pieces of grass were brought individually, whereas a beakful of short pieces 1–2 cm long was carried to the site in a single trip. The bird made 10–15 trips for nest material in an hour, foraging occasionally during that time. On 16 September, the nest was a pendant structure 30 cm long, primarily composed of grass and spider webs, with a few leaves. At this stage, when the bird arrived at the nest with spider webs, it perched on the supporting branch and swung down and around the nest one to three times very rapidly to distribute the webs around the outside of the nest. I was unable to follow further activity at the nest until 26 October, when I found it destroyed. In the immediate area, an individual was seen collecting spider webs, but another nest was not found.

Xolmis cinerea—Courtship behavior was observed on 4 October 1985, at approximately 0600 hours. In disturbed *cerrado* at the top of a bare tree, two birds perched facing each other performed a "disjointed wing-flap" display, lifting their closed wings upward and outward about once per second. Coordinated with this wing movement was a spreading of the tail feathers. After 10 sec, the pair gave an aerial display of twisting, turning, tumbling flight performed directly above the tree. The aerial display lasted about 5 sec and was followed by a second sequence of perched wing-flapping and aerial display.

Machetornis rixosus—In November 1986, a pair nested in a *totai* palm (*Acrocomia totai*) in Concepción. The tree had been used previously as a nest site by *Thraupis palmarum* (see below) and on 8 November 1986 a pair of these tanagers carried nest material to the tree. The tanagers were chased repeatedly by the flycatchers, which eventually gained control of the tree. This tyrant is reported to use abandoned nests of other species (e.g., *Phacellodomus* spp.; Naumberg, 1930; Skutch, 1969), and although Naumberg stated that it does not build a nest, Hilty and Brown (1986) indicate that on occasion it will. The nest in Concepción was not visible beneath a large senescent spathe of the palm, 4 m aboveground—the same spathe under which *T. palmarum* had nested. The flycatchers carried nest material (grass) to the site; they may have been completing or modifying the nest left by *T. palmarum*. At 0945 hours on 23 November 1986, the flycatchers copulated at the top of a mango (*Mangifera indica*) tree near the nest. On 12 January 1987, they fed two fledglings in the nest tree and, on 8 February 1987, the parents and two young foraged together in the yard.

Tyrannus albogularis—Courtship behavior was observed in September and October when pairs, perched in treetops or on electrical wires, performed a wing-fluttering display while uttering a weak, high-pitched trill. Also, there was much chasing between pairs of *T. albogularis* as well as between *T. albogularis* and *T. melancholicus*.

Nest-building activity was observed in mid-September and late October 1985. On 27 October 1985, a nest was under construction on the midrib of a *motocu* (*Scheelea princeps*) palm frond in a weedy field in Concepción. An individual carried a long piece of grass to the nest and then displayed while perched on the frond. A second bird perching on a nearby frond responded with wing-fluttering and trilling. The first bird flew off after about 10 sec, while the second bird sat in the nest working on the inside of the open cup. Two minutes later, the pair performed the wing-fluttering display in a tree 25 m from the nest.

Progne tapera—This cavity-nesting species will use arboreal termite nests (Haverschmidt, 1968) and abandoned hornero (*Furnarius* sp.) nests (Naumberg, 1930; Ridgely & Tudor, 1989). In January 1986, a pair was seen feeding young in an abandoned nest of *F. rufus* on a light pole in Concepción. *Furnarius rufus* fed young in that nest in November 1985. During the 1986–1987 breeding season, the same site but a new nest (nests are removed from poles after the breeding season) was used again, first by *F. rufus* and then by *P. tapera*.

Campylorhynchus turdinus—This wren was observed nest building on two occasions. On 1 De-

cember 1986, an individual was seen adding twigs to a globular nest in a leafless tree in a weedy pasture at the edge of Concepción. The nest was a bulky structure with a side entrance, composed primarily of sticks on the outside; it had been built amid the tangled stems of a dead vine near the end of the branches, 2.5 m above the ground. On 15 April 1987, in the same pasture, a pair was seen carrying nest material under a senescent spathe in a *totai* palm. Naumberg (1930) reported that this wren may refurbish abandoned nests of other species. The pair observed in the *totai* could have been using a nest of *T. palmarum,* a species that regularly built nests under the spathes of this palm.

Oryzoborus maximiliani—This seed-finch was observed at various stages of the breeding cycle in May, August, September, and December, indicating that, for the pair from which these data were collected, breeding was not restricted to the September–March breeding period observed for most other species. On 28 May 1985, a nest containing two young was found. The open cup-shaped nest was similar to the nest of *O. crassirostris* described by Sclater and Salvin (1879) and Haverschmidt (1968). It was constructed principally from pieces of midribs from palm fronds and was situated on the stump of a *motocu* palm surrounded by water in a disturbed marshy stream. The nest was about 0.5 m above the water and 2 m from the edge of the open pool. When discovered, the young had short pin feathers. Both the male and the female fed the young. Only the female was observed brooding. The male frequently was heard singing near the nest. The young fledged on 4 June.

On 31 August 1985, two young approximately 2 days old were found in the same nest described above. Again, only the female was observed brooding. The nest was found empty on 10 September when the female was seen foraging with an immature bird. On 2 December 1985 at the same site, a female was seen feeding a fledgling, indicating a third brood had been produced.

On 27 March 1987, a pair of seed-finches was seen at a site 1 km upstream from that described above. Foraging with the pair was a third individual in brown plumage similar to the female but with blotches of black feathers on the head and neck (juvenile male?). Twice the pair was seen performing an aerial display. The male, perched at the top of a dead tree in the middle of the marsh, pursued the female as she flew over him. Both birds gained considerable altitude and then abruptly went into a falling tumble that stopped just above the canopy of the trees at the edge of the marsh, whereupon they gained perches in the foliage.

Oryzoborus angolensis—In early December 1986, a female was found incubating two eggs in a nest on the same *motocu* stump used by *O. maximiliani* in 1985 (see above). The open cup-shaped nest was composed primarily of pieces of midribs of palm fronds and grass. The eggs were light brown with dark brown speckling. These data differ slightly from previous descriptions of nests and eggs of Colombian birds. Haverschmidt (1968) described a nest of fine grasses with white eggs spotted brown, and Sclater and Salvin (1879) described a "grass cup . . . greenish white eggs thickly spotted brown."

Cypsnagra hirundinacea—On 11 September 1985, in heavily disturbed *cerrado,* a pair of these tanagers carried spider webs to a small tree where they stuck them to forked branches forming a small circle. By the following afternoon, twigs and pieces of grass had been added to the web material. Five days later, the nest was lined with plant down and appeared complete. The open cup-shaped nest was constructed primarily of grass, twigs, and spider webs, with a few leaves stuck loosely to the outside. It was on the fork of a branch, 0.25 m from the trunk and 1 m above the ground. Three eggs were laid in the nest. They were small and pale blue colored, with small black blotches concentrated at the larger end of the egg. The nest was not attended continuously; the pair frequently foraged together in the vicinity of the nest. All three eggs hatched between 4 and 5 October; incubation time was estimated at 14 $\pm$ 1 day.

A nest with three eggs was found on 26 November 1986 in undisturbed *cerrado.* The nest, similar to that described above, had been built at the end of a branch in a *Curatella americana* tree, 0.75 m above the ground. These observations of nests, eggs, and breeding dates are similar to data for this species in Brazil (Isler & Isler, 1987).

Thraupis palmarum—In early September 1985, a pair of these tanagers built a nest in a *totai* palm in Concepción. The nest was not visible, but both the male and the female carried nest material (pieces of dried midribs of palm fronds) under a large senescent spathe, about 4 m above the ground. On 20 November and 2 December 1985, both the male and the female carried food to the nest tree. The incubation period is reported to be 14 days, and the young fledge 17–21 days after hatching (Isler & Isler, 1987). The elapsed time (72 days) between my observations of nest building and birds carrying food to the nest suggests that a second

clutch had been laid. On 17 March 1986, the pair foraged in the yard with two fledglings, indicating that they had made three nesting attempts and produced at least two broods during the 1985–1986 breeding season.

In spring 1986, a pair nested in the same palm tree. Nest-building activity was not observed, but on 4 October a bird carried food to the tree and disappeared under one of the spathes; and on 20 October, both the male and the female took food to the nest. On 8 November, a pair carried nest material to the same palm, but on 21 November the tanagers were chased from the tree by a pair of *Machetornis rixosus* that gained control of the palm and nested in it (see above).

Additional Notes of Interest

Following are observations that are of interest simply because I have found no published accounts of this information.

Xolmis cinerea—In life, the iris of this flycatcher is bright orange-red, but in 1–5 min following the death of the two specimens (FMNH 335227, 335228) collected, iris color changed to a dull yellow.

Machetornis rixosus—It is well known that this tyrant flycatcher forages on the ground or from the backs of livestock. In the early morning (0430–0700 hours), however, the species usually perched at the tops of tall trees (10–12 m), where it sang a weak, high-pitched trill and captured small flying insects by aerial hawking.

The juvenile plumage of this flycatcher appears similar to that of the adult; however, two juvenile specimens (FMNH 335238, 335239) lack a coronal patch and have rectrices that are not pale-tipped. Also, the iris color of these two specimens was light brown rather than brownish orange as in the adult.

Cypsnagra hirundinacea—This tanager usually was found in disturbed *cerrado* near human habitation; it was seen rarely in the more closed undisturbed *cerrado*. Pairs or small groups frequently foraged in mixed-species flocks with *Neothraupis fasciata, Ammodramus humeralis, Emberizoides herbicola,* and *Saltator atricollis,* species that also were seen most commonly in highly disturbed *cerrado*.

These tanagers remained paired and continued to display throughout the nonbreeding season. The display, a rollicking synchronized duet described by Isler and Isler (1987), was performed more frequently during the breeding season. In one 50-min period, a nesting pair displayed seven times from various perches within its territory. A single display lasted 5–15 sec.

Isler and Isler (1987) described this species in central Brazil as usually occurring in groups of three to six individuals. They suggested that these are family groups and that one or two birds usually are employed as helpers at the nest. Near Concepción, this tanager was seen in groups of three to four individuals, all in adult plumage. Isler and Isler (1987) reported "adult plumage is apparently acquired in the second year," but I encountered only one individual (of at least 10 groups) in subadult plumage.

Within a group, two birds were easily recognized as a pair because they duetted and foraged together. The other individual(s) usually remained apart from the pair but followed as the birds moved through their territory. Occasionally, when the pair began duetting, the other group member(s) joined in; this conflicts with previous accounts that nonpair group members do not sing (Isler & Isler, 1987; Parker and Rocha, 1991). Agonistic behavior by the pair toward the other group members was seen rarely and consisted of a brief chase when it did occur. The pair observed nesting in spring 1985 (see above) had a third individual, in adult plumage, on its territory. This bird never was seen near the nest; i.e., it did not appear to act as a helper. One group of three individuals was collected: two females (FMNH 335423, CBF 01422) and one male (FMNH 335422), all in adult plumage with fully ossified skulls. From another group, the apparent nonpair member was collected; it was a female with a fully ossified skull (FMNH 335419).

Discussion

Seasonality

Seasonal fluctuations in the composition of the bird fauna of Concepción are significant. The migration of birds on the South American continent has been, until recently, virtually unstudied. North American species that migrate to wintering grounds in South America are well known; however, their geographic and temporal distribution in the Neotropics has not been delineated for all species. Numerous South American species are known or suspected to migrate (Zimmer, 1938; Sick, 1968), but the details of most seasonal movements (e.g., migration routes, winter ranges, timing of migration)

are undocumented. In Bolivia, the migration of birds has been the focus of one previous study (Pearson, 1980), and Dott (1985) recorded temporal distribution data for a number of North American migrants in Bolivia.

Distribution data of migrant bird species can be gleaned from general references such as Meyer de Schauensee (1970), Norosky (1978), Olrog (1984), Hilty and Brown (1986), Ridgely and Tudor (1989), and Fjeldså and Krabbe (1990). Studies in Rio de Janeiro, Brazil (Davis, 1945), the Pantanal, Mato Grosso, Brazil (Cintra & Yamashita, 1990), and western Amazonia (Pearson, 1980) have provided valuable data on the seasonality of bird communities in those regions. The most extensive migratory data available have been compiled for Brazil by Sick (1968, 1984).

On the South American continent, long-distance or latitudinal migrants are austral species that breed in southern temperate regions and migrate north during the austral autumn. The present study, as well as a few others (Pearson, 1980; Cintra & Yamashita, 1990; Willis & Oniki, 1990), indicate that other bird species undergo local migrations or movements. While long-distance migration presumably occurs to avoid cold winter temperatures, the reason for local or short-distance movements is not always obvious. Local migrants may be responding to a change in food supply or nesting habitat related to wet versus dry seasons rather than to cold versus warm seasons.

In the area of Concepción, at least 30% of the total 257 species are not resident year-round (Table 2). This figure, which includes occasional visitors, is similar to results from the Pantanal, Brazil (ca. 500 km east of Concepción), where 28% of the total 317 species are seasonal (Cintra & Yamashita, 1990). North American species account for 14% of the part-time residents and casual visitors at Concepción compared to 13% in the Pantanal. The majority (72%) of the South American migrant and visitor species in the Concepción area are passerines, whereas in the Pantanal a larger proportion (60%) are nonpasserines. The difference reflects the greater number of aquatic species recorded in the Pantanal. At both locations, more southern migrants were recorded in the dry season (austral winter) than in the wet season. If North American species are included, however, the number of migrant species is about the same for wet and dry seasons.

At Tumi Chucua in northwestern Bolivia (Dpto. Pando), Pearson (1980) recorded 52 migrant species from September to November, 13% of the estimated 420 total species. Northern breeding species composed 75% of the seasonal visitors. The smaller proportion of migrant species, particularly South American species, at Tumi Chucua may reflect the difference in habitats between that location and the Concepción and Pantanal areas, as well as their different geographical positions on the continent. Pearson (1980) suggested that the effect of a large number of resident species (ca. 420/km^2) at Tumi Chucua could be an important factor in the small number of migrant species. A long-term study at Tumi Chucua could increase the list of migrant species.

Of the 78 species that are not permanent residents in the area of Concepción, 40% appear to be long-distance, austral migrants (Table 2). There is previous documentation for these southern breeders that migrate north in winter, with the exception of the seedeaters *Sporophila ruficollis, S. hypochroma,* and *S. minuta.* Ridgely and Tudor (1989) noted that the ranges of many seedeaters "are still surprisingly imperfectly known" and some of the southern breeding species may be long-distance migrants, hence the inclusion of those species as austral migrants. *Sporophila lineola,* a known transamazonian migrant, was not identified in the mixed-species *Sporophila* flocks in Concepción, although the site conceivably is on its migratory route (Ridgely & Tudor, 1989). If no full adult male *S. lineola* were in the Concepción flocks, this species could have been overlooked.

Tyrannus melancholicus is a partial migrant in the study area; i.e., the population includes year-round residents and migrants. The southern subspecies *T. m. melancholicus* is an austral migrant (Fjeldså & Krabbe, 1990) and it was most common in Concepción during migration periods (March–April and September–October). It was uncommon during the dry season and rare during the wet season (when it was common in the city of Santa Cruz, 200 km southwest of Concepción).

The 17 species listed as local migrants in Table 2 were selected on the basis of abundance data. These species were sufficiently common during one season to make their absence during the alternate season notable. The reason for the seasonality of these species in Concepción is not known, but it appears they migrate only a short distance. *Pitangus sulphuratus* and *Coryphospingus cucullatus,* for example, were recorded 200–225 km from Concepción during the wet season when they were absent from the study area. Local migrations may

TABLE 2. Migrant species and occasional visitors in the vicinity of Concepción, Bolivia.[1]

Long-distance migrants		Local migrants		Occasional visitors
Ictinia plumbea[2,6]	W/T	*Falco femoralis*[2]	W	**Pandion haliaetus*
**I. mississippiensis*	T	*Columbina talpacoti*	W	*Phalacrocorax brasilianus*
**Pluvialis dominica*	T	*Aratinga acuticauda*[7]	D	*Mycteria americana*
**Tringa melanoleuca*	T	*Crotophaga major*[7]	W	*Ciconia maguari*
**Tringa flavipes*	T	*Chlorostilbon aureoventris*[4]	D	*Jabiru mycteria*
**Tringa solitaria*	T	*Polytmus guainumbi*[7]	D	*Elanoides forficatus*
Columbina picui[4]	D	*Leptopogon amaurocephalus*[8]	P	*Rostrhamus sociabilis*[2,7]
Podager nacunda[2]	D	*Myiophobus fasciatus*	D	*Buteogallus urubitinga*
Elaenia spectabilis[6]	T	*Casiornis rufa*[7]	P	*Phaetusa simplex*
Elaenia parvirostris[2]	W	*Myiarchus ferox*[8]	W	*Anthracothorax nigricollis*
Elaenia chiriquensis[6]	W	*Pitangus sulphuratus*[2,4,8]	D	*Hylocharis chrysura*
Serpophaga subcristata	D	*Myiozetetes cayanensis*[2]	D	*Suiriri suiriri*
Pyrocephalus rubinus[2]	D	*Cyclarhis gujanensis*	D	**Empidonax alnorum*
Knipolegus hudsoni[2]	D	*Volatinia jacarina*[2,7]	D	*Lathrotriccus euleri*[6–8]
Myiarchus swainsoni[3,6]	T	*Coryphospingus cucullatus*[7]	D	*Hymenops perspicillata*[2,4]
Myiodynastes maculatus[3,6]	W	*Pheucticus aureoventris*[2]	D	*Fluvicola pica*[7]
Empidonomus varius[2,3]	W	*Basileuterus flaveolus*	D	*Satrapa icterophrys*[4,7]
E. aurantiocristatus[2,3]	T			*Siryستes sibilator*[2,8]
Tyrannus albogularis[4]	W			*Megarynchus pitangua*[2,7]
Tyrannus melancholicus[2,4,8]	P			*Alopochelidon fucata*[2,5]
Tyrannus savana[3,4]	T			*Thryothorus genibarbis*
**Tyrannus tyrannus*	T			*Donacobius atricapillus*
Progne tapera[3,5]	W			*Polioptila dumicola*
**Progne subis*	T			**Catharus fuscescens*
**Hirundo rustica*	T			*Turdus hauxwelli*
Turdus amaurochalinus[2,5]	D			*Sicalis flaveola*
Mimus triuris[2,5]	D			*Sicalis luteola*[2,5]
Sporophila caerulescens[2,5]	T			*Saltator maximus*
Sporophila minuta	T			*Cyanocompsa brissonii*
Sporophila ruficollis	T			*Leistes superciliaris*[2,5]
Sporophila hypochroma	T			
31 species		17 species		30 species

[1] Superscripts refer to published accounts of migratory behavior. * = Northern Hemisphere migrant, D = dry season, P = partial migrant, T = transient, W = wet season.

[2] Sick, 1984.

[3] Zimmer, 1938.

[4] Fjeldså and Krabbe, 1990.

[5] Ridgely and Tudor, 1989.

[6] Hilty and Brown, 1986.

[7] Cintra and Yamashita, 1990.

[8] Davis, 1945.

be longitudinal or altitudinal rather than latitudinal, as in long-distance migrations. These small-scale movements, if related to food and/or habitat availability influenced by wet and dry seasons that vary annually in intensity, could vary among years, depending on local conditions. The abundance of *C. talpacoti* and *C. cucullatus*, for example, varied markedly between 1985 and 1986 (see above). Although temperature and rainfall in the vicinity of Concepción did not vary significantly between those years, conditions in areas from which or through which the species migrated possibly influenced their abundance in the study area.

Concepción lies in an extreme portion of the range of four species of local migrants recorded only during the dry season (*Polytmus guainumbi, Myiozetes cayanensis, Basileuterus flaveolus,* and *Pheucticus aureoventris*). Possibly those species wander or expand their range during the nonbreeding (dry) season. *Pheucticus aureoventris* may be an altitudinal migrant, as it appears to be in Brazil (Sick, 1984), breeding in the eastern foothills of the Bolivian Andes and wandering into lowland habitats during the dry season.

Six of the local migrants from Concepción also are seasonal in the Pantanal (Cintra & Yamashita,

1990): *Aratinga acuticauda, Crotophaga major, Polytmus guainumbi, Casiornis rufa, Volatinia jacarina,* and *Coryphospingus cucullatus.* At both locations, *P. guainumbi, V. jacarina,* and *C. cucullatus* were present during the dry season, whereas *C. major* was recorded during the wet season. *Casiornis rufa* is a partial migrant in Concepción (more common in the dry season than in the wet season) and present in the Pantanal only during the dry season. *Aratinga acuticauda,* a dry-season resident in Concepción, is seasonal in the Pantanal but the data were insufficient to describe precisely its migratory calendar. At least five species seasonal in the Pantanal are permanent residents at Concepción: *Porphyrula martinica, Aratinga leucophthalmus, Xolmis cinerea, Myiarchus tyrannulus,* and *Vireo olivaceus.* With the exception of *P. martinica,* recorded January to July, these species apparently migrate from the Pantanal area at the end of the wet season.

Nine species seasonal in Concepción were recorded year-round in the Pantanal (*Falco femoralis, C. talpacoti, Chlorostilbon aureoventris, Myiophobus fasciatus, Myiarchus ferox, P. sulphuratus, Myiozetetes cayanensis, Cychlaris gujanensis,* and *Basileuterus flaveolus*). There are previous reports of migratory behavior for *F. femoralis* in Brazil (Sick, 1984), for *Ch. aureoventris* in Argentina (Fjeldså & Krabbe, 1990), for *P. sulphuratus* in Brazil (Davis, 1945; Sick, 1984; Willis & Oniki, 1990) and Argentina (Fjeldså & Krabbe, 1990), and for *M. cayanensis* in Brazil (Sick, 1984). Southern populations of *Ch. aureoventris igneus* and *P. sulphuratus argentinus* migrate north in winter (Fjeldså & Krabbe, 1990), but the southern subspecies were not those recorded in Concepción (*Ch. a. aureoventris* and *P. s. bolivianus*). Austral populations of *M. ferox* have been considered nonmigratory (Lanyon, 1978), but Norosky (1978) listed this species as a "summer visitor" that bred in Prov. Buenos Aires, Argentina, during the austral summer and migrated in autumn. Davis (1945) described *M. ferox* as a visitor during the breeding (wet) season in Rio de Janeiro, Brazil, and suggested it may be an altitudinal migrant. In Concepción, *M. ferox* was recorded only during the wet (summer) season.

The seasonality of *C. talpacoti, M. fasciatus,* and *C. gujanensis* is puzzling. There are no previous reports of migratory behavior for these species, and Concepción is well within their respective ranges. It is unlikely that the presence of these species was overlooked because they are nonsecretive and easily identified in the field.

Leptopogon amaurocephalus seems to be a partial migrant in the study area, for its abundance varied seasonally. It was fairly common during the wet season and uncommon to rare in the dry season. The species has been reported seasonal in Brazil, where it was recorded in the dry season (Rio de Janeiro, Davis, 1945; Pantanal, Willis & Oniki, 1990). Cintra and Yamashita (1990), however, recorded this flycatcher year-round in the Pantanal.

More difficult to assess are the 30 species listed in Table 2 as occasional visitors. These species were recorded less than four times per year and, therefore, are not considered regular members of the local avian community. In several cases, Concepción is located at the edge of the species's range, where appropriate habitat probably is limited and low abundance would be expected. The presence of these species in the study area may vary depending on local conditions influenced by rainfall. *Turdus hauxwelli* and *Saltator maximus,* for example, prefer more humid regions and are found more commonly north of Concepción, whereas *Polioptila dumicola* and *Cyanocompsa brissoni* are more common south of Concepción in the drier *chaco* woodlands (Ridgely & Tudor, 1989). *Donacobius atricapillus,* recorded only once in Concepción, was present year-round in the Pantanal (Cintra & Yamashita, 1990) and was common along the Río Paraguá, 200 km E of the study area (pers. obs.).

Ten of the occasional visitor species have been reported previously as migratory (Table 2). Records from the study area during migration periods (March–April and September–October) and/or the nonbreeding season suggest that Concepción is at the edge of the migratory route or of the winter range of those species. Finally, a number of the occasional visitors are species known to wander widely: *Mycteria americana, Ciconia maguari, Jabiru mycteria, Elanoides forficatus, Phalacrocorax brasilianus,* and *Phaetusa simplex.*

Clearly, further study is needed to describe completely the seasonality of the bird communities in northeastern Bolivia. Data from year-round, multiyear studies will clarify the status of local migrants and occasional visitors. Some of the species listed as local migrants could prove to be long-distance migrants, whereas some of the occasional visitors may be rare permanent residents. Additional study could expand the list of seasonal species; for example, data for 12 species seasonal in the Pantanal were insufficient to determine their status in Concepción. Banding studies should be

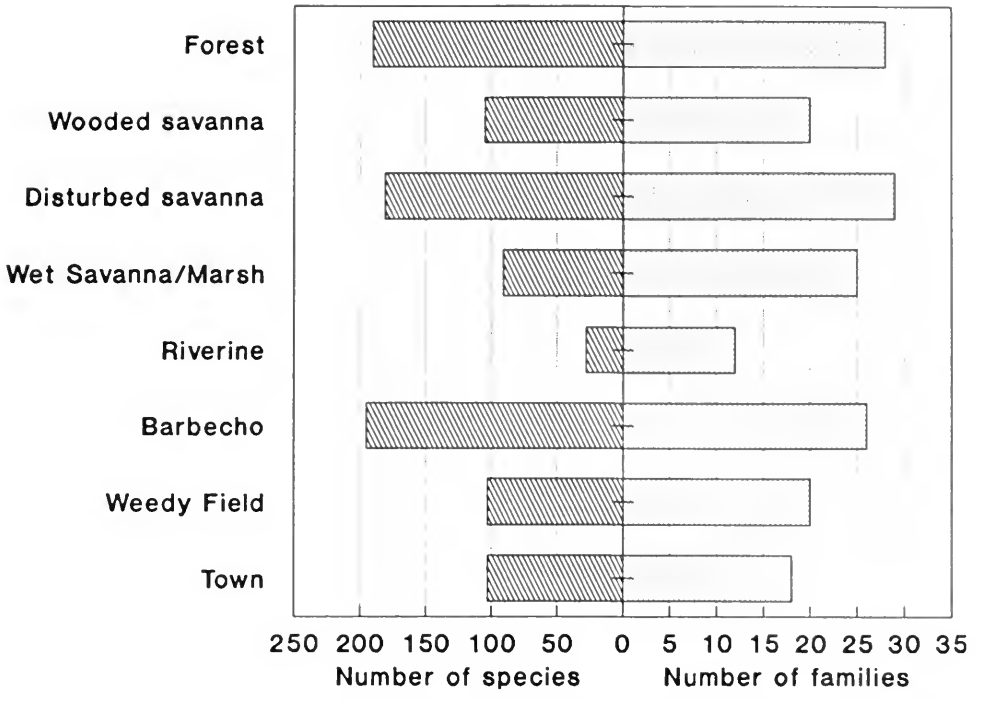

FIG. 4. The number of bird species and families recorded in each habitat in the vicinity of Concepción, Bolivia. *Barbecho* includes data from second-growth scrub and second-growth woodland. In counting the number of families, the subfamilies Turdinae, Polioptilinae, Emberizinae, Cardinalinae, and Thraupinae were treated separately.

initiated in Bolivia. Collaboration with ongoing banding programs in Brazil and Argentina would help elucidate the geographical and temporal distribution of many migrant species.

Habitat Use and Conservation

The composition of the bird communities in the area of Concepción illustrates the unique nature of Chiquitanía as a zone of transition between major biogeographical regions. The list contains a number of species common to Amazonian forest formations (e.g., *Agamia agami, Pipile pipile, Geotrygon montana, Chloroceryle aenea, Thamnophilus schistaceus, Mionectes oleagineus, Myiornis ecaudatus,* and *Habia rubica*) (Meyer de Schauensee, 1970; Remsen & Traylor, 1989). Also, there are numerous species characteristic of the Brazilian *cerrado* (e.g., *Lepidocolaptes angustirostris, Melanopareia torquata, Schistochlamys melanopis, Neothraupis fasciata, Cypsnagra hirundinacea,* and *Saltator atricollis*) (Sick, 1966; Ridgely & Tudor, 1989), and several that are more abundant in the drier woodlands of the Gran Chaco (e.g., *Polioptila dumicola, Coryphospingus cucullatus,* and *Passerina brissonii*) (Short, 1975; Ridgely & Tudor, 1989).

Figure 4 shows the number of bird species recorded in each of the major habitats in the vicinity of Concepción. The diversity of the forest bird community is assumed to be higher than depicted because that habitat was not sampled thoroughly. The relatively high diversity of birds in disturbed *cerrado* reflects the variable nature of that habitat. Compared to undisturbed *cerrado,* the disturbed savanna is more open and has numerous weedy forbs and shrubs. The similarity index of the avifauna recorded for the various habitats (Table 3) shows that highly disturbed *cerrado* has a relatively large number of species in common with weedy fields, *barbecho* scrub, and towns. Undisturbed *cerrado,* on the other hand, has fewer species in common with man-altered habitats.

It is notable that several of the species considered characteristic of Brazilian *cerrado* (e.g., *N. fasciata, C. hirundinacea,* and *S. atricollis*) (Sick, 1966) were more common in highly disturbed *cerrado* when compared to undisturbed sites. These disturbed savannas had only scattered trees due

TABLE 3. Similarities in bird faunas among habitats[1] in the vicinity of Concepción, Bolivia; values are the number of species in common (and Sorensen's Index of Similarity).[2]

	Fh	Fe	Fg	Fi	C	Cd	I	MP	R	Bs	Bw	W	T	A	Total no. species
Fd	11 (19.8)	1 (2.0)		6 (8.3)	4 (4.3)	7 (5.3)			2 (3.5)	6 (6.3)	17 (19.0)		4 (4.4)		79
Fh			1 (4.7)	1 (2.1)		1 (0.9)	1 (2.5)		1 (3.0)	2 (2.8)	5 (7.6)	1 (1.5)	1 (1.5)	1 (4.2)	32
Fe					4 (6.2)	3 (2.9)	3 (8.6)			4 (6.0)	3 (4.9)	1 (1.6)	1 (1.6)	1 (5.1)	23
Fg					1 (1.7)	2 (2.1)	2 (6.9)	2 (6.9)	2 (8.9)			1 (1.7)			11
Fi					10 (11.7)	13 (10.4)	1 (1.8)		1 (2.0)	11 (12.5)	9 (10.9)	1 (1.2)	5 (5.9)	1 (2.5)	65
C						33 (22.8)	6 (7.8)	1 (1.3)	2 (2.9)	11 (10.1)	8 (7.8)	10 (9.4)	12 (11.4)		106
Cd							5 (4.3)	1 (0.9)	1 (0.9)	27 (18.3)	14 (9.9)	39 (26.9)	23 (15.9)	4 (4.0)	184
I								13 (27.7)	2 (4.9)	2 (2.5)		5 (6.5)	4 (5.3)	1 (3.2)	47
MP									3 (7.4)	3 (3.8)		2 (2.6)			47
R										3 (4.1)	4 (6.0)	2 (2.9)	1 (1.4)		34
Bs											16 (15.2)	9 (8.3)	16 (14.8)		111
Bw												4 (3.9)	12 (11.7)	1 (1.7)	100
W													21 (19.9)	4 (6.6)	106
T														3 (5.0)	105
A															16

[1] Habitat codes are the same as those described in the key following Table 1 with the following exceptions: MP includes data from marsh and pool habitats, and R includes data from all riverine habitats.

[2] Sorensen's Index of Similarity = number of species in common/[(number of species in *A* + number of species in *B*)/2] × 100 (Mueller-Dombois & Ellenberg, 1974).

to the firewood-gathering activities of nearby residents. Possibly the disturbed sites were preferred because of a lower density of trees. Recent work by Negret (in Isler & Isler, 1987) shows that in the Brazilian tableland, *N. fasciata* prefers dense *cerrado,* whereas *C. hirundinacea* primarily occurs in grasslands with scattered trees (*campo sujo*). Parker and Rocha (1991) found *C. hirundinacea* and *S. atricollis* to be quite common in *campo sujo* in northeastern Dpto. Beni. The disturbed *cerrado* in the study area also was used by granivorous species that commonly occurred in weedy fields and pastures but were rare in undisturbed *cerrado* (e.g., *Sporophila* spp. and *Volatinia jacarina*). This may reflect the greater abundance of annual forbs that accompanies disturbance and the resulting increase in available seed supply.

More than one-third (29 species) of the migrant and visitor species primarily used *cerrado* habitats (disturbed or undisturbed), and 21 species were recorded most commonly in *barbecho* scrub or weedy fields. Twelve migrant species were recorded in forest but only three species (*Leptopogon amaurocephalus, Catharus fuscescens,* and *Turdus hauxwelli*) used forest habitats exclusively. Although forest habitats were not surveyed thoroughly, the data indicate that most migrants are nonforest species. At Tumi Chucua (Pearson, 1980) and in the Pantanal (Cintra & Yamashita, 1990), migrant bird species also were seen more commonly in nonforest habitats.

In Chiquitanía, both forest and savanna habitats are threatened by development as land is cleared for cattle ranching, timber harvesting, colonization, and urbanization. The situation may be most critical for forest bird species. More than half (45) of the 72 species recorded in dry and/or humid forest were restricted to those habitats; they never were recorded in nonforested or man-altered habitats. Of special interest are the birds of the humid forest found at the base of a few low mountain ranges (*serranías*) scattered throughout Chiquitanía. The soil that supports these forests is rich in nutrients and therefore is threatened to be cleared for agricultural activities (Killeen et al., 1990). These forests provide refuge to humid forest bird species not found in any other habitat in the area. The Bolivian *cerrado* species appear to be more flexible than forest species in their habitat requirements. Of the 45 species recorded in undisturbed *cerrado,* 34 (76%) also used man-altered habitats such as disturbed savanna, weedy fields, *barbecho,* or town. Many savanna species near Concepción seem able to adapt to at least some alteration of their environment.

The avifauna of the dry semideciduous forests of the Brazilian Shield has been recognized by Snow (1985) as one of the three most threatened groups of birds in South America. Chiquitanía presently has the largest contiguous expanse of seasonal forest on the continent, and more work is needed to thoroughly describe the avifauna of this forest formation. The commonly used descriptions of the forest as "semideciduous" or "seasonal" give the impression that the forested regions of the Brazilian Shield are homogeneous. Actually the forest in this region is a reticulated mosaic of distinct vegetation types including *cusi* (*Orbignya phalerata*) palm forest, swamp forest, bamboo forest, and liana forest (Killeen et al., 1990). The bird communities in the different types of forest probably differ and need to be surveyed. By sampling the forest communities throughout the yearly cycle, the seasonal and breeding status of the birds also can be documented.

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